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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

H.O.D. Landfill
Antioch, Lake County, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for the H.O.D. Landfill (the Site) in Antioch, Illinois, which was chosen in accordance with the Comprehensive, Environmental, Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the Site. The Administrative Record Index identifies items that comprise the Administrative Record, and is included as an appendix to this Record of Decision (ROD).

The State of Illinois has verbally concurred with the selected remedy. The United States Environmental Protection Agency (USEPA) will include the State letter of concurrence in the Administrative Record upon receipt of the letter.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the selected remedy in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy will be a final Site-wide remedy. The selected remedy addresses the sources of the contamination by containment of the landfill and contaminated soils, and treatment of leachate and landfill gas. The major components of the selected remedy for the Site are:

- waste cap improvements
- enhanced gas collection and treatment
- enhanced leachate collection
- leachate treatment
- groundwater monitored natural attenuation
- institutional controls

The selected remedial action will address the low level threat of contaminated groundwater posed by the Site. Principal threat wastes are defined by USEPA as source materials that are highly mobile or highly toxic, and incapable of being reliably contained. Groundwater is generally not considered a source material. Since there are no principal threats from the Site, treatment of the waste mass was not included in the selected remedy.

USE OF NATURAL ATTENUATION FOR GROUND WATER RESTORATION IN LIEU OF GROUNDWATER TREATMENT

The USEPA has determined that use of natural attenuation for groundwater restoration will result in expeditious attainment of cleanup levels, and that risks associated with the contaminated groundwater will be minimized in the interim. Based on monitoring data and geological information, USEPA believes that cancer risks and other hazards to human health associated with contacting the groundwater can be minimized by monitoring the groundwater and restricting its use until the levels of contaminants in the water are below drinking water standards, background levels, and/or other health-based standards. The USEPA has determined that groundwater at the Site does not pose a threat to off-site residential drinking water supplies, and that restricting groundwater use will prevent any contact with this water.

Natural attenuation is a viable remedy for contamination found in the groundwater at the Site based on the specific hydrogeological conditions present. The USEPA believes that known groundwater remediation technologies will not significantly expedite attainment of groundwater cleanup levels over that anticipated to be attained through natural attenuation. Furthermore, due to the immobile and highly localized nature of the groundwater contamination, USEPA believes that groundwater remediation is not a suitable alternative.

Groundwater contaminant levels will be closely monitored to ensure that there is progress toward and expeditious attainment of groundwater cleanup levels. Should future evidence show the existence of a groundwater contaminant plume, or should progress toward or attainment of expeditious cleanup not occur through natural attenuation, USEPA has specified in this ROD that the contingency measure of an active, groundwater remediation alternative be considered.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the selected remedy, and is cost-effective. The selected remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable. Since the selected remedy includes leachate and landfill gas treatment, the selected remedy satisfies the statutory preference to employ treatment as a principal element to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants.

Because the selected remedy will result in hazardous substances remaining on-site, a review will be conducted within five years after commencement of remedial action to insure that the selected remedy continues to provide adequate protection of human health and the environment.

Wm. E. Muno

William E. Muno, Director
Superfund Division

9/28/98
Date

RECORD OF DECISION
H.O.D. LANDFILL SUPERFUND SITE

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DECISION SUMMARY
H.O.D. LANDFILL SUPERFUND SITE
ANTIOCH, ILLINOIS

I. Site Name, Location, and Description

The H.O.D. Landfill Superfund Site (the Site) is located within the eastern boundary of the Village of Antioch in Lake County, in northeastern Illinois. See Figure 1. The Site consists of approximately 51 acres of landfilled area out of the total 121.5 acres of property that make up the facility. Although the landfilled area is continuous, it consists of two separate landfill areas, identified as the "old landfill" and the "new landfill." The "old landfill" consists of 24.2 acres situated on the western third of the property. The "new landfill" consists of 26.8 acres located immediately east of the "old landfill." The two landfill areas have been legally delineated under an Illinois Environmental Protection Agency (IEPA) permit. The location of the two landfill sections is shown in Figure 2.

There are approximately 14,300 people living within three miles of the Site. Approximately 40 private wells and 6 public water supply wells are in the vicinity, and are used for domestic purposes, including drinking water.

The Site is bordered on the south and west by Sequoit Creek. Silver Lake is located approximately 200 feet southeast of the Site. A large, seasonal wetland area extends south of the Site from Sequoit Creek.

Surface drainage around the Site is generally toward the Fox River, located approximately five miles west of the Site. Locally, surface water flows from the Site toward Sequoit Creek. Sequoit Creek flows west from Silver Lake along the southern boundary of the Site, then flows north along the western boundary of the Site. Approximately 250 feet north of the northwestern corner of the Site, the creek channel turns west and the creek flows approximately two miles before discharging into Lake Marie. Lake Marie eventually discharges into the Fox River.

The landfill cover is continuous across the filled areas of the Site. The landfill cover ranges in thickness from a total of 49 inches to 87 inches based on borings and test pits performed during the Remedial Investigation (RI). Refuse was generally encountered beneath the existing landfill cover. The landfill cover supports a healthy vegetative layer. Since the closure and capping of the Site in 1989, precipitation has resulted in erosional rills and gullies in some areas of the landfill cover. See Figure 3. Several areas of differential settlement and stressed vegetation have developed since the cap construction. Minor leachate seeps, animal burrows, and landfill gas (LFG) emission areas have also been noticed since the cap construction.

Based on aerial photographs and a 1960 United States Geological Survey (USGS) topographic map of the Site area, the eastern portion of the Site was a wetland area prior to landfill development. Seasonal wetlands exist within only the low elevation portion of the Site, south of the "new landfill" area. The wetlands are limited to the areas outside the delineated landfill boundaries. Sequoit Creek flows from Silver Lake by way of two stream channels which eventually join and proceed through the seasonal wetlands.

Four distinct, depositional units make up the Site geology. The four units are, in order of increasing depth and age, the surface soils, the surficial sand, the clay-rich diamict, and the deep sand and gravel. For Site hydrogeology, the hydrostratigraphic units of concern that underlie the Site are, in order of increasing depth, the surficial sand aquifer, the clay-rich diamict aquitard, and the deep sand and gravel aquifer. The June, 1998 Feasibility Study (FS) contains more information on the geology and hydrogeology of the Site.

A. Land Use

The Little Silver Lake Subdivision in unincorporated Lake County is located east of the Site. Agricultural land, scattered residential areas, and undeveloped land are located to the north. A large industrial park area (Sequoit Acres Industrial Park), which was constructed on former landfill and fill areas, is located west of the Site and borders Sequoit Creek. Several companies have operations on Sequoit Acres Industrial Park, including some companies that are designated as small quantity hazardous waste producers.

The Site is currently zoned as "M2," according to the Village of Antioch. This designation covers special use manufacturing and industrial purposes, and includes landfills. The Site was closed and capped under IEPA permitting in 1989. Sequoit Acres Industrial Park has been designated an "M1" (light industrial) zoning area by the Village of Antioch.

Future land use is expected to be similar to current land use. According to Village of Antioch officials, the Village of Antioch is expected to experience significant population growth in the next five years.

B. Groundwater Use

The Village of Antioch obtains its water from six water supply wells screened in the deep sand and gravel aquifer. This is the same aquifer under and adjacent to the Site. The Village wells are located west and southwest of the Site. The closest Village well to the Site, Village Well 4 (VW4), was decommissioned in 1997 and replaced with Village Well 7 (VW7), approximately one mile southwest of the Site.

Privately owned wells in the vicinity of the Site are either screened in the same deep sand and gravel aquifer as the Village wells, or in the deep, underlying dolomite. In particular, residents of the Little Silver Lake Subdivision use these private wells. Household wastewater from the subdivision is discharged to septic systems.

Future groundwater use is expected to be similar to current use.

II. Site History and Enforcement Activities

A. Site History

Permitted waste disposal activities began at the Site in approximately 1963 and continued through approximately 1984. The Site has been owned and/or operated by three distinct companies:

- Cunningham Cartage and Disposal Company (1963 - 1965)
- H.O.D. Disposal, Inc. (1965 - 1972)
- C.C.D. Disposal, Inc. (1972 - present, including merger with Waste Management of Illinois, Inc. (WMII))

Murrill Cunningham, owner, operator, and president of the Cunningham Cartage and Disposal Company, operated a 20-acre landfill (much of the "old landfill" area) at the Site from 1963 until August 1965. The property was then purchased by John Horak and Charles Dishinger, who operated the Site under the name H.O.D. Disposal, Inc. In December 1972, the 20-acre landfill was conveyed to C.C.D. Disposal, Inc., and C.C.D. Disposal, Inc. purchased the adjacent 60-acres of land to the east of the Site. WMII merged with H.O.D. Disposal, Inc. in December 1972 and C.C.D. Disposal, Inc. in June 1973, gaining ownership of the entire Site. An eastern portion of the Site is currently owned by the Village of Antioch. WMII operated the landfill from 1973 until 1984 when the Site stopped accepting waste. During the time WMII operated the landfill, portions of the "new landfill" area were opened for landfilling.

In June 1981, WMII submitted to the USEPA a Hazardous Waste Site Notification Form, as required by Section 103(c) of CERCLA. The form indicated solvents, heavy metals, and cutting and hydraulic oils were disposed of at the Site, in addition to municipal waste.

The USEPA conducted a Preliminary Assessment in 1983, a Site Inspection in 1984, and an Expanded Site Inspection between 1986 and 1989. In 1989, the Site was closed, and a landfill cover, leachate wells, and LFG vents were installed in accordance with the applicable regulations in force at the time. The Site was placed on the National Priorities List (NPL) on February 21, 1990, based on a Hazard Ranking Score (HRS) of 34.68 (out of 100), which was above USEPA's eligibility threshold limit of 28.5 for Sites to be proposed for the NPL. The USEPA identified a number of potentially responsible parties (PRP); however, only WMII agreed to participate in the Remedial Investigation/Feasibility Study (RI/FS). An Administrative Order on Consent (AOC) to perform the RI/FS was signed between USEPA and WMII in August, 1990.

In May, 1990, WMII retained Montgomery Watson (formerly Warzyn) to support WMII's RI/FS effort by preparing the Work Plan for Preliminary Site Evaluation Report/Technical

Scope (PSER/TS) and by subsequently performing the RI. The RI was conducted between 1990 and 1994. The final RI Report was approved by USEPA on February 14, 1997. The draft Baseline Risk Assessment (BLRA) was submitted by ICF Kaiser (a WMII contractor) in 1994. WMII received comments on the BLRA from IEPA and USEPA in late 1996/early 1997. WMII responded to the BLRA comments, and the BLRA was approved by USEPA on October 29, 1997.

Several investigations have been conducted at the Site and are listed below in approximate chronological order. Additional details and the results of the investigations are described in the RI Report.

- In 1965, prior to drilling and constructing VW4, three test holes were drilled (to identify adequate thickness of water bearing units) in the Sequoit Acres Industrial Park area.

- A soil investigation was conducted by Testing Services Corporation (TSC) in 1973 to assess conditions for the expansion of the landfill and the construction of an on-site maintenance building.

- TSC installed six groundwater monitoring wells for WMII in May, 1974.

- In 1982, TSC prepared a hydrogeologic report for the proposed landfill expansion to the north.

- Five leachate samples were collected from leachate/gas wells and from a leachate collection manhole in May, 1993. The analytical results and field parameters may be found in Appendices O-3 through O-7 and Table 4-1 of the RI Report, respectively.

- A Preliminary Assessment (PA) was completed on February 11, 1983 by the field investigation team (FIT) at the request of USEPA. The PA identified several data gaps including determination of waste quantity and information related to possible groundwater or surface water contamination.

- A Site Inspection was conducted on July 10, 1984 by the FIT. Groundwater samples were collected from on-site monitoring wells. Analysis of groundwater samples revealed the presence of elevated concentrations of zinc, lead, and cadmium. Analysis of surface water samples did not reveal elevated levels of analyzed parameters.

- Dames and Moore conducted a hydrogeologic assessment of the Site in 1985 at the request of WMII.

- In January, 1986, IEPA collected groundwater samples from four residential wells located east of the Site. The samples were analyzed for nitrates, organic compounds, and trace metals. The results of the chemical analysis indicated no trace metals and no organic compounds were detected.

- An Expanded Site Investigation (ESI) was conducted by the FIT (Ecology and Environment) during the period of 1987 through 1989.

- Between 1989 and July 1990, P.E. LaMoreaux & Associates, Inc. (PELA), on behalf of WMII, conducted various Site investigations.

- Video camera logging of VW4 was conducted by PELA. Some areas of the well appeared to be badly pitted.

- Patrick Engineering, Inc. (Patrick) prepared an Environmental Audit of Sequoit Acres Industrial Park in 1989 on behalf of WMII. Patrick concluded that several potential sources of soil and/or groundwater contamination existed in the Sequoit Acres Industrial Park, including industry and landfilled areas containing fill and refuse.

- Shallow borings were drilled at three locations in October 1989 by Patrick for Geoservices Inc. of Boynton Beach, Florida, to collect samples of the clay diamict for laboratory permeability testing. Hydraulic conductivity values for the clay soils ranged from 2.1 X 10^{-7} centimeters per second to 9 X 10^{-9} centimeters per second. Results of the permeability testing of the clay diamict soils are summarized in Table 5 of the PSER/TS.

- Five temporary leachate piezometers were installed at the "old landfill" for WMII by Stratigraphics, Inc. in July, 1990. Leachate samples were collected for laboratory analysis from temporary leachate piezometers in July and August, 1990. The Stratigraphics report indicated clay underlies refuse at each of the temporary leachate piezometer locations. Samples were analyzed for organics, metals, and indicator parameters. Low levels of volatile organic chemicals (VOC), primarily alkenes and aromatics, were detected in each of the leachate samples. Few detections of semi-VOCs (SVOC) were noted in the leachate samples, with naphthalene being the most commonly detected of the SVOCs. The RI presented specific leachate analytical data.

- A Hydropunch groundwater sample was collected near monitoring well US4S in May, 1990. The sample was collected from a fine to medium sand at a depth of about 20 feet below ground surface and was submitted for VOC analysis. VOCs detected in the groundwater sample included cis-1,2-dichloroethylene (110.3 parts per billion (ppb, equal to micrograms per liter (μg/l)), trans-1,2-dichloroethylene (1.4 ppb), methylene chloride (2.7 ppb) and vinyl chloride (188.4 ppb).

- Groundwater quality samples were collected by WMII at 10 on-site monitoring wells in July, 1990. Samples were analyzed for organics, metals, and groundwater quality indicator parameters. Analytical results indicated that VOCs were detected in samples collected from wells US4S (cis-1,2-dichloroethylene at 39.7 ppb; trans-1,2-dichloroethylene at 1.8 ppb), US6D (trichloroethylene (TCE) at 0.7 ppb) and R103 (cis-1,2-dichloroethylene at 0.5 ppb and TCE at 4.0 ppb).

- The USGS, in cooperation with USEPA, performed an evaluation of the aquifer pump test data collected during the ESI Report and presented the results in a 1990 report titled "Determination of Hydraulic Properties in the Vicinity of a Landfill Near Antioch, Illinois."

- Leachate results from the 1996 and 1997 semi-annual compliance reports can be summarized by ranges as follows: barium from 736 to 837 ppb, chromium from 12.3 to 20.5 ppb, iron from 6,680 to 11,600 ppb, lead from 5.0 to 7.1 ppb, magnesium from 118,000 to 139,000 ppb, zinc from 21.9 to 49.5 ppb, 1,1-dichloroethane at 6 ppb, 1,2-dichloroethane from 6 to 13 ppb, 1,2-dichloropropane from 9 to 17 ppb, benzene from 12 to 19 ppb, ethylbenzene from 22 to 41 ppb, methylene chloride from 8 to 26 ppb, toluene from 140 to 210 ppb, TCE from 7 to 9 ppb, and vinyl chloride from 11 to 15 ppb.

B. Enforcement Activities

The USEPA proposed adding the Site to the NPL on September 18, 1985, based on a Site Inspection which found elevated levels of zinc, lead, and chromium in the groundwater (50 Fed. Reg. 37,956 (1985)). During the public comment period, WMII challenged the proposed listing of the Site based on disagreement concerning the HRS and hydrogeological conditions at the Site. Following review of all comments, USEPA performed an ESI at the Site. The ESI led USEPA to rescore the Site, based in part on a lowered estimate of the level of zinc releases, as well as on newly discovered releases of TCE, trans-1-2-dichloroethylene and total-1-2-dichloroethylene to the groundwater. The Site was added to the NPL on February 21, 1990 (55 Fed. Reg.6162 (1990)).

On December 26, 1989, USEPA issued special notice to several PRPs and began negotiations for performance of an RI/FS. These negotiations resulted in an AOC with WMII to perform the RI/FS and to pay USEPA's oversight costs. WMII began an RI at the Site in August, 1990, and the RI Report was approved by USEPA in February, 1997. WMII completed the FS in June, 1998.

The USEPA issued a demand letter to the PRPs on February 24, 1992 to recover past response costs associated with the Site. When no settlement was reached by the close of the negotiation period, USEPA nominated the Site for Alternative Dispute Resolution (ADR) on May 14, 1992. The USEPA referred the cost recovery action to the Department of Justice for civil litigation on June 30, 1992. On November 5, 1993, a Consent Decree provided for reimbursement of

$636,000 in costs incurred by USEPA through August 19, 1990. This Consent Decree involved 13 PRPs, comprised of WMII, the Village of Antioch, and eleven generators. In November 1997, USEPA issued a number of information requests under CERCLA Section 104(e) in an unsuccessful attempt to identify additional PRPs.

III. Highlights of Community Participation

The USEPA developed a Community Relations Plan in 1993 to ensure that the public was well informed during the Superfund process. As part of this process, residents near the landfill were interviewed to find out their concerns. The main concerns were drinking water, property values, and being kept informed of future Site events.

In order to respond to these needs, USEPA produced a fact sheet and held public information meetings in 1993. In April, 1993, USEPA issued a press release announcing the start of the RI by WMII. Since then, USEPA has perceived community interest to be low, and USEPA's public involvement efforts were correspondingly reduced. In December, 1997, USEPA met with Village of Antioch officials in Antioch to provide an update of Site-related activities and to discuss the Village's concerns.

The USEPA issued the Proposed Plan to the public on July 22, 1998. In order to encourage public participation in the remedy selection process consistent with Section 117 of CERCLA, the RI/FS and the remainder of the Administrative Record file for the Site were made available for review by the public at the Antioch Public District Library in Antioch, and at USEPA Region 5 offices in Chicago, during and before the public comment period. The public comment period ran from July 22 through August 20, 1998. An announcement regarding the public comment period and describing the preferred alternative in the Proposed Plan was published in the Daily Herald newspaper on July 22, 1998 and in the Antioch News Reporter newspaper on July 24, 1998.

A public meeting was held in the Antioch Village Hall on August 11, 1998. The meeting was attended by approximately 40 people, including representatives from WMII, Montgomery Watson (a WMII contractor), the Lake County Health Department, the Village of Antioch, and local newspapers. At the meeting, representatives from USEPA summarized the findings of the RI/FS, explained the Proposed Plan and remedy selection process, answered questions from the public, and accepted statements from members of the public. Comments were recorded by a court reporter, and a transcript of the meeting is included in the Administrative Record.

The USEPA received a total of six written submittals from the public during the public comment period. This included written comments from some PRPs (WMII and the Village of Antioch). Public comments recorded during the public meeting and a comment from the United States Army Corps of Engineers are included in the Responsiveness Summary (Appendix A) of this ROD, but are not included in the count of six written submittals from the public.

The USEPA's responses to comments received during the public comment period are contained in the Responsiveness Summary. In some cases, USEPA summarized or consolidated comments to present a more readable document.

This ROD presents the selected remedy for the H.O.D. Landfill Superfund Site in Antioch, Lake County, Illinois, chosen in accordance with CERCLA, as amended by SARA, and the NCP. The decision for the Site is based on the Administrative Record. The Administrative Record includes all items and documents such as work plans, data analyses, public comments, transcripts, and other relevant information provided by Section 113 of CERCLA. The Administrative Record Index is attached to this ROD as Appendix B. The provisions for public participation in remedy selection in Section 113(k)(2)(B)(i-v) and Section 117 of CERCLA have been satisfied.

IV. Scope and Role of the Response Action

The selected remedy will be a final Site-wide remedy. The main threat to human health identified in the BLRA is through the ingestion of vinyl chloride-contaminated groundwater. Vinyl chloride, a carcinogen, has appeared in a monitoring well, nearby and downgradient of the Site, at levels above the maximum contaminant level (MCL) established by USEPA and above the Illinois Pollution Control Board Groundwater Quality Standards for drinking water aquifers. The NCP requires remediation of drinking water sources with contaminant levels above MCLs. The Human Health Risk section shown later in this ROD further describes the vinyl chloride threat and lesser threats.

The Site will be remediated according to USEPA's Presumptive Remedy guidance. This guidance establishes containment as the presumptive remedy for CERCLA municipal landfills, such as the H.O.D. Landfill. Containment technologies are appropriate for municipal landfill waste because the volume and heterogeneity of the waste generally make treatment of the waste impractical. As is true for this Site, the presumptive remedy also often includes leachate collection and landfill gas collection, as well as institutional controls such as deed restrictions.

Containment through waste cap improvements minimizes infiltration of rainwater into the waste mass, thereby minimizing leachate generation and slowing contaminant migration from the waste mass into the groundwater. Waste cap improvements also prevent direct contact with the waste mass. Leachate collection reduces potential migration of leachate to surface water and groundwater. Landfill gas collection prevents direct inhalation and uncontrolled migration of gases, eliminates potential explosion hazards, and significantly reduces the dissolution of VOCs from the landfill gas into the leachate or groundwater.

V. Summary of Site Characteristics

A. Nature and Extent of Contamination

The following media were sampled during the RI: groundwater (from Site and nearby monitoring wells, Village wells, and Little Silver Lake Subdivision private wells), leachate, landfill gas, surface water, sediments, and surface soils. A monitoring well and piezometer location map is included as Figure 4. Leachate piezometer and gas probe locations are shown on Figure 5. Surface water, sediment, and surface soil sampling locations are shown in Figure 5 of the FS. The Village of Antioch and private water supply well sampling locations are shown in Figures 6 and 7 of the FS, respectively. Tables 4 through 9 of this ROD present summaries of VOC, SVOC, pesticides, and polychlorinated biphenyl (PCB) analytical results for sampling conducted during the RI. Based on results of the BLRA (see Section VI), ingestion of vinyl chloride, a VOC, presents the only significant health risk associated with the Site.

The groundwater samples collected from wells screened in the surficial sand immediately adjacent to the "old landfill" area in which VOCs were detected were found to contain relatively low concentrations of alkenes and carbon disulfide. (Carbon disulfide was detected during the RI in the Round 1 and Round 2 samples collected from well G11S at concentrations of 0.8J ppb and 18 ppb, respectively. 1,2-Dichloroethylene was detected during the RI in the Round 1 and Round 2 samples collected from well US4S at concentrations of 35 ppb and 44 ppb, respectively. "J" indicates an estimated value below the detection limit.) VOCs were not detected in the surficial sand wells located on the west or south sides of Sequoit Creek during either of the two rounds of groundwater samples obtained as part of the RI. See Table 6 and Figure 4. In Table 6, wells with a "D" designation indicate sampling from the deep sand and gravel aquifer, wells with an "I" designation indicate sampling from the clay diamict, and wells with an "S" designation indicate sampling from the surficial sand aquifer. The second page of Table 6 includes private well and village well results.

For the clay diamict sampling, TCE was detected in one groundwater monitoring well (US6I) which is located at the southeast corner of the "old landfill" area. The TCE concentrations in groundwater samples collected from that monitoring well since 1987 exhibit a decreasing trend.

VOCs were not detected in the on-site deep sand and gravel wells. VOCs (vinyl chloride and 1,2-dichloroethylene) were detected in groundwater samples from one deep sand and gravel monitoring well (US3D), which is located southwest of the Site, in the industrial park. VOCs (vinyl chloride, acetone and 1,2-dichloroethylene) were also detected in one water supply well, VW4, which was the closest Village well to the Site. This well was decommissioned in 1997, and replaced with VW7, farther west of the Site.

Although VOCs were detected in the on-site surficial sand wells, they were not present in the on-site deep sand and gravel wells, indicating that downward migration of VOCs from the surficial sand through the clay diamict does not appear to be occurring. The differences in the hydraulic heads from the surficial sand and the deep sand and gravel also indicate that the clay diamict may be continuous and may provide resistance to downward vertical flow (i.e., low vertical hydraulic conductivity).

Concentrations of VOCs (2-Hexanone and 4-methyl-2-pentanone) were estimated below the detection limits in one surface water sample which was collected from Sequoit Creek during Round 1. This sample was collected adjacent to the northwest corner of the landfill. No other VOCs, SVOCs or Pesticides/PCBs were detected in any of the other Round 1 or Round 2 samples. See Table 7.

The concentrations of inorganic constituents detected in the surface water samples are much lower than the concentrations detected in the leachate samples. Results presented in the RI indicate that Site leachate has not had a detectable effect on Sequoit Creek surface water quality.

No VOCs or pesticides/PCBs were detected in the sediment samples collected from Sequoit Creek. Concentrations of SVOCs that were estimated below the detection limits consisted of polynuclear aromatic hydrocarbons (PNAs), with the exception of bis(2-ethylhexyl) phthalate, which is a common laboratory contaminant. The PNAs could be due to other industrial sources, as they are common to urban industrial areas. See Table 8.

Surface soil samples during the Round 1 sampling activities were collected from areas exhibiting discolored soils, leachate seeps, stressed vegetation, or standing water. These locations were chosen as "worst case" samples in order to document the potential effects of the Site's LFG and leachate on the shallow surface soils of the Site.

The surface soil analytical results generally indicate that concentrations of VOCs (primarily aromatics and methylene chloride/acetone) and SVOCs (primarily phthalates and PNAs) are present in areas with visible evidence of potential impact. No VOCs and few SVOCs were detected in a sample collected from an off-site location north of the "new landfill" in an area of standing water and apparent stressed vegetation. Similarly, fewer VOCs and SVOCs were detected off-site in a sample collected from a wetland area near the southeast corner of the "old landfill" and in a sample collected from the wetland area east of the "new landfill." See Table 9.

B. Contaminant Fate and Transport

Migration pathways are defined as routes along which contaminants migrating out of, and away from, a contaminant source (e.g., landfill leachate or LFG) travel towards groundwater, surface soil, surface water, and sediments. The primary vehicle for mobilization of VOCs is partitioning of contaminants from LFG into the leachate and interstitial water in the waste. The primary transport mechanism from the source areas is via LFG, leachate, or groundwater migration.

LFG generation in the reducing environment of the landfill is largely the byproduct of anaerobic decomposition of the refuse. Gas pressure within the landfill builds, and gas migrates away from the waste mass through the path of least resistance. Passive gas flares have been installed in the landfill to vent and burn off this gas but are not totally effective. Therefore, some LFG appears to be migrating horizontally and vertically through the surface soils in some locations.

Leachate is produced through the solution and suspension of chemicals mobilized by the interaction of the interstitial water with the waste mass and LFG. The water necessary for the formation of leachate may enter the landfill interior in the following ways: 1) stormwater infiltration through the cover, 2) groundwater seepage through the subsurface, and 3) moisture present within the waste at the time of placement within the landfill.

Leachate may migrate out of the landfill in the following ways:

- Release and transport by groundwater
- Release directly to surface water and sediments
- Release through the landfill cover and potential release to the surface soils, surface water, and sediments

Potential chemicals of concern in landfills, such as those at the Site, can be mobilized by the interstitial water passing through the waste and dissolving chemicals which form leachate, and by chemicals in LFG partitioning into the leachate. This leachate may then migrate from the landfill to affect potential receptors.

However, a landfill itself functions as a bioreactor, where the organic substrate (the organic fraction of the waste mass), in the presence of moisture, produces an anoxic (reducing) environment which degrades organic compounds and stabilizes the waste mass. This reaction produces LFG, which is primarily a combination of methane and carbon dioxide, with trace concentrations of VOCs.

The potential transport of the chemicals of concern to groundwater may be minimized by the low permeability clay underlying the waste, similar to the clay underlying the entire Site, and by the organic materials and peat, similar to that underlying areas of the southern portion of the "old landfill." Low permeability clay materials, peat, and organic materials have a high capacity to adsorb the chemicals of concern, thereby helping to significantly reduce the concentrations of chemicals entering the groundwater. Further attenuation occurs by mixing, adsorption/desorption, biodegradation, oxidation and reduction reactions, precipitation, and volatilization as groundwater moves away from a landfill.

Once generated, LFG migrates from areas of high gas pressure to areas of low pressure (above the fluid levels in the landfill) and is flared (combusted) or emitted to the ambient air via the following release pathways:

- Leachate piezometer/gas wells
- Unlit gas flares
- Fissures in the landfill cover

The ensuing dilution of the gas in the air is affected by wind speed, turbulence, temperature, height of the release point above the surrounding area, the roughness of the surrounding area, and by decomposition through direct photolysis.

Some LFG chemical constituents commonly partition into the soil (including the landfill cap) or vadose zone, interstitial soil water. The infiltration of this vadose zone water presents a potential transport pathway for LFG chemical constituents to enter the leachate and eventually the surficial sand aquifer. This mechanism can contribute to leachate and/or groundwater contamination.

Leachate samples collected from the Site contained a variety of chemical compound groupings, including chlorinated alkanes and alkenes, ketones, aromatics, phenols, phthalates, PNAs, and PCBs.

The biodegradation of waste materials in a reducing environment produces various chemical degradation compounds in the leachate. The biodegradation process may consume much of the organic contaminant mass and produce ammonia, methane, carbon dioxide, and other anaerobic biodegradation and abiotic intermediate and end products. These compounds are detected in the landfill leachate and gas, and indicate that a high level of anaerobic biodegradation is occurring.

Stormwater percolating vertically through the landfill cap into the waste mass and groundwater flowing horizontally into the waste mass provide the transport and mixing vehicle that promotes anaerobic biological and abiotic degradation of the chemical compounds. During this process, some of the compounds and degradation products remain or are introduced into the liquid leachate, while other compounds partition into the gas phase. The chlorinated alkenes and alkanes which were detected in the leachate tend to biodegrade more readily under the reducing conditions present in the landfill.

Leachate may migrate from the waste mass into the surrounding subsurface soils or groundwater, or may enter the ambient environment via surface seeps. As leachate moves from the waste mass, conditions become less anaerobic (less reducing), providing an environment more favorable to aerobic degraders. It is under these conditions that the phenols, ketones, aromatics, and to a lesser degree the PNAs and phthalates, will be more readily biodegraded.

In addition to biodegradation, adsorption occurs in both the waste mass and in the subsurface environment as leachate moves through the system. Adsorption is a significant attenuation mechanism for the relatively less soluble and less degradable leachate constituents such as the PNAs, phthalates, and PCBs. Leachate from the landfill can mix with and be transported by groundwater, so dilution and groundwater attenuation processes may also influence contaminant concentrations.

In addition to subsurface movement, a leachate seep was observed in an erosional cut in the cover near the center of the south slope of the "new landfill." The leachate flows from the landfill and down the erosional cut towards the base of the landfill where standing water was periodically observed during wet seasons.

Relatively higher concentrations of metals were detected in the leachate than in the surrounding groundwater, soils, surface water, or sediments. The concentrations of metals detected in the leachate, except for barium, are all below the IEPA-specified typical range of values for leachate from municipal solid waste landfills. Metals in leachate can migrate into the ambient environment along the same pathways described above. Metals concentrations in leachate tend to increase as metal complexes dissolve into leachate from the waste mass under highly reducing anaerobic biodegradation conditions present in the landfill. These conditions are not suitable for metals precipitation which would reduce the metals concentrations in the leachate. Concentrations of metals in leachate that migrate to the surface and subsurface environments are attenuated through dilution, adsorption, precipitation, and oxidation/reduction. Concentrations of metals in the leachate will drop rapidly when exposed to oxygen, as metal complexes form.

VOCs were detected in groundwater samples from the on-site surficial sand monitoring wells. Shallow groundwater within the surficial sand flows toward and discharges to Sequoit Creek. Strong horizontal gradients are present in the surficial sand and result in rapid, shallow groundwater flow (4 to 215 feet per year). Groundwater elevation data also indicate the presence of a very slight downward vertical gradient within the surficial sand aquifer and the clay-rich diamict aquitard. However, the RI data indicate that the hydraulic conductivity of the surficial sand is more than two orders of magnitude greater than that of the clay-rich diamict. Therefore, dissolved constituents will readily migrate horizontally toward Sequoit Creek rather than vertically into the clay aquitard.

Based on the information presented, groundwater flow and contaminant migration in the vicinity of the southeast and southwest corners of the "old landfill" are toward Sequoit Creek, with the shallow groundwater discharging to the Creek. The surface water and sediment analytical results indicate that the contaminants detected in on-site shallow groundwater samples have not migrated to the Creek.

TCE was detected at one Site well in the clay till aquitard. This compound will migrate slowly with groundwater flow in the clay till. Deep groundwater flow is slow and predominantly downward through the low permeability clay aquitard under the existing hydraulic gradient. The attenuation of organic and inorganic contaminants is high within the clay, primarily through adsorption. Further dilution and biodegradation can also occur, although biodegradation is probably limited within the clay till.

For organic sampling in the deep sand and gravel aquifer, the contaminants of concern selected for the BLRA (see Table 2) were detected in the off-site deep sand and gravel aquifer at the three Village wells (VW3, VW4, and VW5) and at monitoring well US3D. The organic contaminants of concern detected in the first round samples collected from the Village wells included carbon disulfide, 2-methylphenol, and 4-chloroaniline. During the second round of sampling, detected contaminants of concern included acetone, chloroform, cis-1,2-dichloroethylene, and 1,2-dichloroethane. The organic contaminants of concern detected in monitoring well US3D included vinyl chloride and 1,2-dichloroethylene in both sampling rounds.

The contaminants detected in the deep sand and gravel can be transported with groundwater flow in the deep sand and gravel at a flow velocity between 3 and 8 feet per year. These contaminants are attenuated through dilution, biodegradation, and adsorption.

For inorganic groundwater sampling, arsenic was detected in samples from municipal wells VW3 and VW5, but based on the background and downgradient data, arsenic may not be an analyte associated with the Site. Beryllium was also detected in the off-site surficial sand aquifer. However, beryllium was identified as a compound of potential concern only because background data for beryllium was not available. See the "Summary of Site Risks" Section for further discussions of arsenic and beryllium.

Surface water does not appear to have been affected by the landfill. Low concentrations of two ketone compounds were detected in one surface water sample. These compounds were not detected in the second round of surface water sampling. As previously discussed, these compounds would be significantly attenuated by adsorption, dilution, and volatilization in surface water.

Inorganic contaminants of concern in the surface water included antimony, barium, and lead. These metals in the surface water would also attenuate through dilution, adsorption to particulate matter, and precipitation along the pathways discussed at the beginning of this section.

SVOCs were the only compounds detected in two of the sediment samples collected from Sequoit Creek along the perimeter of the "old landfill." The primary transport mechanism for the migration of these organic compounds from the landfill to the Sequoit Creek sediments would be migration and discharge of groundwater to Sequoit Creek. SVOCs are attenuated by dilution and biodegradation and are adsorbed to soils and sediments. Once entrained in the soils and sediments, these organic compounds will either be consumed through biodegradation or will be released to surface water and groundwater, and further attenuated by dilution.

As described in the BLRA, the metals detected in sediments are arsenic and thallium. These metals are attenuated through adsorption and precipitation as they migrate through the pathways previously discussed. The metals can be released to the surface water under physical agitation or can be dissolved into surface water through the reduction of the metals in a reducing sediment environment. Once in the surface water, oxidation is likely to cause the metal complex to precipitate and be transported with surface water flow.

The surface soil organic and inorganic impacts on the Site appear to be primarily related to localized LFG and leachate seeps through the landfill cap. As the leachate and LFG migrates through the cover material, many VOCs are volatilized into the air. Other less volatile and inorganic constituents are adsorbed to the surface soils. Precipitation may then transport these constituents to surface water and/or groundwater through overland runoff and infiltration.

Phthalates detected in the surface soils are strongly adsorbed to the organic materials in the soils, and thus will resist leaching into the groundwater. To a limited extent, biodegradation may also occur in surface soils. PNAs found in the surface soils are also strongly adsorbed to soils, have low water solubilities, and are therefore not expected to be mobilized by precipitation. Under aerobic conditions PNAs will undergo natural biodegradation. The inorganics determined to be contaminants of concern in the BLRA generally were selected due to the lack of regional background data. These metals are attenuated in the surface soils. Precipitation and oxidation also occur as the metal complexes are exposed to the atmosphere.

VI. Summary of Site Risks

A. Human Health Risks

The BLRA was conducted to characterize the current or potential future threat to human health and the environment that may be posed by chemicals originating at or migrating from the Site. The BLRA was primarily based on data and information obtained during the RI. The IEPA and USEPA reviewed and commented on the BLRA, and USEPA approved the final BLRA on October 29, 1997.

The first step in the risk assessment process was to select appropriate chemicals of potential concern based on data from the RI and on naturally occurring background chemical concentrations in the soils and groundwater. Chemicals of concern are those chemicals present at the Site most likely to be of concern to human health and the environment. The selected chemicals of concern and the rationales for selection are identified in Tables 2 and 3.

The next step was to identify potential and complete pathways of concern to human health. The following pathways were selected for detailed evaluation:

- Incidental ingestion of on-site surface soil by child/teenage trespassers on the Site
- Dermal absorption of chemicals in on-site surface soil by child/teenage trespassers on the Site
- Dermal absorption of chemicals in Sequoit Creek surface water by child/teenage trespassers on the Site
- Incidental ingestion of Sequoit Creek sediment by child/teenage trespassers on the Site
- Dermal absorption of chemicals in Sequoit Creek sediment by child/teenage trespassers on the Site
- Groundwater ingestion from public water supply wells by nearby adult residents
- Groundwater ingestion from private wells by nearby adult residents
- Groundwater ingestion from off-site groundwater monitoring wells by nearby adult residents (surficial sand and the deep sand and gravel aquifers)
- Inhalation of VOCs while showering with groundwater from public water supply wells by nearby adult residents
- Inhalation of VOCs while showering with groundwater from the off-site deep sand and gravel aquifer by nearby adult residents
- Dermal absorption while showering with groundwater from public water supply wells by nearby adult residents
- Dermal absorption while showering with groundwater from private wells by nearby adult residents
- Dermal absorption while showering with off-site groundwater (surficial sand and the deep sand and gravel aquifers) by nearby adult residents
- Inhalation of VOCs emitted from the landfill surface by nearby residents

Potential exposures within each identified pathway scenario were then calculated using reasonable maximum exposure (RME) protocols, as is the USEPA-accepted method for a BLRA. This method produced a conservative estimate of risks at the Site.

Chemical concentrations at the potential points of exposure were calculated and combined with information on the magnitude, frequency, and duration of potential exposures. Mathematical models were used to estimate exposure point concentrations in indoor air while showering and in ambient air from LFG emissions. Once this step was completed, RME excess lifetime cancer risks and RME hazard indices were calculated for the predominant chemicals in each exposure pathway.

Tables 4 through 9 summarize the SVOC, VOC, and pesticides/PCB analytical results for all media considered in the RI (leachate, landfill gas, groundwater, surface water, sediments, and surface soil). These tables do not include inorganics results, since the BLRA showed only vinyl chloride (a VOC) to be a significant risk (see below).

A summary of the BLRA results for carcinogenic risk is shown in Table 10. Only one chemical in one pathway, ingestion of vinyl chloride from the off-site deep sand and gravel aquifer groundwater, exceeded the established carcinogenic risk guideline of 1×10^{-4} used by USEPA to determine if remedial action generally is warranted. The excess lifetime cancer risks from inhalation and dermal absorption of vinyl chloride while showering with water from off-site deep sand and gravel aquifer collectively add a risk of 9×10^{-5} to the ingestion risk of 8×10^{-4}.

The quantified, carcinogenic risk for vinyl chloride is based on MCL exceedances of vinyl chloride in a single monitoring well (well US3D; see Figure 4 for the location) adjacent to and downgradient of the waste boundary at the Site. Table 6 shows that the vinyl chloride level in US3D (in the deep sand and gravel aquifer) was as high as 35 ppb. The USEPA MCL for vinyl chloride is 2 ppb; therefore, contaminant levels in US3D have been as high as 17.5 times the MCL. Deep sand and gravel aquifer groundwater analytical results from wells near US3D did not detect vinyl chloride during the RI.

Other chemicals that posed a lifetime carcinogenic risk greater than 1×10^{-6} were:

- Beryllium — ingestion and dermal absorption while showering with off-site surficial sand and gravel aquifer groundwater (equating to a total carcinogenic risk of 7×10^{-5})
- Beryllium — dermal absorption from surface soil (equating to a total carcinogenic risk of 1×10^{-5})
- Arsenic — ingestion of municipal well water (equating to a total carcinogenic risk of 9×10^{-5})

In accordance with the Technical Work Plan for the BLRA, the concentrations of chemicals in on-site groundwater were compared to Federal and State standards and guidelines. See Table 22 for the Illinois Pollution Control Board (IPCB) Groundwater Quality Standards used.

Beryllium was detected in 1 of 4 samples from off-site, surficial sand groundwater at a concentration of 0.95 ppb. The surficial sand aquifer is not a drinking water aquifer. Beryllium was not detected in on-site, surficial sand or deep sand and gravel groundwater, or in off-site, deep sand and gravel groundwater. It was detected in 1 of 34 regional background samples at a concentration of 1.0 ppb. The IPCB Groundwater Quality Standard for beryllium is 4.0 ppb.

The two detected concentrations of arsenic in municipal well samples of 2.1 ppb and 4.3 ppb are well below the USEPA MCL of 50 ppb, which is also the Illinois Pollution Control Board Groundwater Quality Standard. The two detected concentrations are well within the regional background range of 1-26 ppb.

Table 10 also summarizes noncarcinogenic risk levels. For an RME Hazard Index of greater than one, USEPA concludes that there is a significant risk to human health or the environment. Table 10 shows that no exposure pathways (individually or cumulatively) resulted in an RME Index of greater than one, indicating that children or adults are not likely to experience adverse, noncarcinogenic health effects from exposure to contaminants from the Site.

In summary, the BLRA evaluated risks to human health from potential and complete pathways. These pathways included various exposure scenarios from surface soil, surface water, air, sediment, groundwater from public and private wells, and groundwater from off-site wells. Only one exposure scenario, ingestion of vinyl chloride from the off-site deep sand and gravel aquifer groundwater, exceeded the MCL and/or the 1 X 10^{-4} carcinogenic risk threshold used by USEPA to determine if remedial action generally is warranted.

This vinyl chloride exposure scenario is unlikely because use of groundwater from the Site vicinity has been prohibited by the Village of Antioch ordinance (Antioch Water Works and Sewage Ordinance Sections 50.008, 52.009, and 52.011) requiring new residences within the Village limits to connect to the municipal water supply system, and because VW4, near and downgradient of the Site, has been taken out of service. Also, analysis of downgradient private well samples to date have shown no detects of the contaminants of concern. Finally, evidence to date does not indicate a contaminant plume in the groundwater that could migrate toward active wells.

B. Ecological Risks

The BLRA contains an ecological risk assessment of the Site. The following information is a summary of that assessment. More detailed information can be obtained by reading the BLRA, available in the information repository. The ecological risk assessment evaluated exposure pathways via surface water, sediments, surface soil, air, and leachate seeps.

For risk via surface water pathways, information from sampling Sequoit Creek indicated that risks to aquatic and terrestrial wildlife are minimal. Chemical concentrations in shallow groundwater near the creek were low, suggesting that the overall contribution of groundwater to surface water is not likely significant with respect to ecological exposures. For Sequoit Creek surface water samples, only iron was detected at concentrations above background levels. But the iron concentration was well below the chronic ambient water quality criterion, suggesting that iron poses no threat to aquatic life. Organic contaminant concentrations were also low, indicating an unlikely threat to aquatic life.

Terrestrial wildlife are also unlikely to be affected by contaminant concentrations in the creek. For example, the toxicological limit of iron in mammals is well above that which could be obtained by ingesting surface water from the creek. None of the low concentrations of contaminants detected will bioaccumulate in aquatic prey; therefore, food-chain exposures are not of concern.

The results of sediment sampling in Sequoit Creek indicate that contaminant concentrations do not likely pose a threat to aquatic life of the creek. Contaminant concentrations were generally below the screening level sediment guidance values that have been developed. Terrestrial wildlife are also unlikely to be at risk from exposure to creek sediment contaminants at the concentrations detected.

Results of surface soil sampling showed that contaminant concentrations were low relative to potentially toxic concentrations, indicating an overall low risk to terrestrial wildlife. Other factors contributing to probable low risk are the sporadic distribution of contaminants in surface soil that would likely result in sporadic wildlife exposure, and the fact that none of the detected contaminants bioaccumulates in terrestrial food chains.

Contaminant criteria for the protection of wildlife species from exposure to airborne contaminants have not been established, making an impact evaluation difficult. Measured contaminant concentrations from the landfill gas samples are below threshold limit values established for human workers. Assuming wildlife species are no more sensitive than humans to inhalation exposure of VOCs, the concentrations measured in the landfill gas are not likely to cause adverse effects in soil-dwelling species. Burrowing and soil-dwelling species are likely to experience the greatest exposures because they can be exposed to contaminants in soil gas prior to dispersion and dilution of the gas on the landfill surface.

Terrestrial wildlife exposure to contaminants present in leachate was judged to be limited because surface seeps flow intermittently and because other surface water that could serve as a source of drinking water for wildlife is accessible and prevalent in the surrounding area. It is unlikely that the contaminant concentrations found in the surface leachate could be such to cause toxicity in intermittently exposed wildlife. Although many contaminant concentrations detected in leachate seep water were above those that could be toxic to certain aquatic life, the overall effect of such toxicity, if occurring, is considered very low, given the size of the seeps relative to other available habitat in the area.

Based on observations of the conditions of the vegetative communities of the Site, local vegetation, including terrestrial plants, appeared to be unaffected by surface soil contaminants, exposure to landfill gas via stomatal uptake, or exposure to surface leachate via uptake through roots or leaves.

In conclusion, pathways exist by which aquatic and terrestrial wildlife might be exposed to contaminants of potential concern present at or migrating from the Site. Overall, however, contaminant concentrations are such that potential risks to plants, aquatic life, and terrestrial wildlife are estimated to be minimal. Visual observations of the character and composition of the terrestrial and aquatic communities of the Site suggest a relatively healthy community. These observations, combined with predictions of low exposure and risk, support the conclusion that biological populations and communities of the area have not been adversely affected by contaminants present at or migrating from the Site.

C. How Current Risks Compare with Remediation Goals

The following remedial action objectives are pertinent to Site remediation:

- Preventing direct contact (dermal contact or ingestion) with impacted soil and landfill contents

- Minimizing infiltration and contaminant leaching to groundwater

- Controlling surface water runoff and erosion

- Collecting and treating contaminated leachate to prevent further migration of contaminants from the source area

- Controlling and treating LFG

These objectives are consistent with the presumptive remedy objectives identified in the USEPA "Presumptive Remedy for CERCLA Municipal Landfill Sites" guidance of September, 1993. Also implementation of the selected remedy (described in Section IX of this ROD) of waste cap improvements, gas collection and treatment upgrades, leachate collection upgrades, leachate treatment, monitored natural attenuation, and institutional controls will achieve the remedial action objectives listed above.

The current risk that is driving USEPA's decision to remediate the Site under CERCLA is the carcinogenic risk of ingesting and showering with vinyl chloride-contaminated water. This risk has been identified in the BLRA as approximately 9×10^{-4}. See Table 10. The remediation goal for groundwater from drinking water aquifers on and near the Site are for contaminant levels not to exceed IEPA Groundwater Quality Standards, which are at or below MCLs, for USEPA Safe Drinking Water Act National Primary Drinking Water contaminants. Implementation of the selected remedy identified in this ROD, using the groundwater remediation goal described, will reduce carcinogenic risks to a level of between approximately 1 X 10^{-4} and 1 X 10^{-6} or less, consistent with the remediation goals identified in the NCP.

Actual or threatened releases of hazardous substances from the Site, if not addressed by the selected remedy, may present a current or potential threat to public health, welfare, or the environment.

VII. Description of Alternatives

In addition to the No Further Action (NFA) alternative, the sets of alternatives are presented as: Capping (C1, C2, and C3), Landfill Gas Collection and Treatment (G1, G2, and G3), Leachate Collection (LC1, LC2, LC3, and LC4), Leachate Treatment and Disposal (LT1, LT2, and LT3), and Groundwater Monitoring (GW1 and GW2). Regardless of the alternatives selected, the following Site-related features will be implemented or will continue to be implemented:

- Institutional controls, including restrictions on private well use
- Site access restrictions, including fencing, locked gates, and warning signs
- Post-closure care consisting of cap maintenance, storm water control, landfill gas collection, and leachate collection and treatment
- Groundwater monitoring

Tables 11, 12, and 13 list the chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARAR), respectively, for the Site. The alternatives will be evaluated against the major ARARs in the next section ("Summary of Comparative Analysis of Alternatives").

Table 14 provides a brief description of each alternative. Table 15 summarizes capital costs, operation and maintenance (O&M) costs, and present worth values for each alternative. A discount rate of seven percent is used, consistent with USEPA's Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.3-20.

A. The No Further Action Alternative

The NCP requires the "No Action" or "No Further Action" (NFA) response alternative to be carried through detailed analysis. Under the NFA alternative, no further remedial actions would be implemented at the Site under CERCLA. However, the routine O&M activities currently being performed at the Site under the existing IEPA permit, which include cap maintenance, and O&M of the existing passive LFG and manual leachate collection systems, would continue. The groundwater monitoring activities being performed at the Site would also continue under this alternative. See Figure 4 for existing monitoring well and piezometer locations, and Figure 5 for existing gas and leachate extraction devices. The NFA alternative includes the gas collection and treatment alternative G1, the leachate collection alternative LC1, the leachate treatment alternative LT1, and the groundwater monitoring alternative GW1. These four alternatives are described later in this section. The existing Site security fence and deed restrictions would remain in place along with all existing Site control features, including the in-place landfill cover, and the leachate and LFG collection and control systems. The following estimated cost is associated with the NFA alternative:

- Capital Cost $923,200
- Annual O&M $196,360
- Total Present Worth (30 yrs @ 7%) $3,360,000

The costs for decommissioning VW4 and installing VW7 are included in the above cost estimate. The decommissioning of VW4 and installation of VW7 have already been completed at a cost of $652,800, and VW4 will eventually be abandoned at an estimated cost of $39,400.

B. Capping Alternatives

1. C1: Landfill Cap Restoration and Maintenance

This alternative involves using cover materials from the existing cap (or off-site clay, if necessary) to restore the cap to the approximate grades which existed when the Site was closed in 1989. Based on observations and performance to date, the "old landfill" has an excellent vegetative cover and is very uniform over the entire area. The "new landfill" area has some limited areas of erosion, differential settlement, and resulting ponded water. Therefore, the cap repairs would be performed on the "new landfill" area, with limited potential repairs on the "old landfill" area. The cap repairs would be performed by supplementing the existing cover, thus adding thickness to the existing soil cover of 49 to 87 inches. (This soil cover thickness is documented in the RI Report.) Alternative C1 would involve stripping and stockpiling existing cover soils in the low areas and other areas to be repaired on the Site. Clay soils from the existing cover or from an off-site source would be compacted into the low areas and used to repair leachate seeps. The stockpiled cover soils, along with necessary supplementary soils from an off-site source, would then be regraded atop the compacted clay to promote drainage and eliminate surface water ponding. After regrading is completed to promote drainage, a 12-inch thick soil layer would be placed on the repaired areas and seeded to establish vegetation. The resulting dual layer cap would meet or exceed the final cover specifications embodied in 35 IAC 807 (which call for "a compacted layer of not less than two feet of suitable material").

Construction activities would include the removing vegetation; stockpiling of topsoil to be reused as vegetation layer soils; consolidating the off-property waste at the northern edge of the "old landfill" onto Site property; regrading, placing, and compacting the clay soils; placing the uncompacted, vegetative layer soils; and re-establishing the vegetation. The existing landfill access roads are adequate; therefore, the construction of additional access roads is not included under this capping alternative. Construction activities would be planned to avoid encroaching on or impacting the adjacent wetlands or floodplain.

The regrading of the Site would be performed to improve areas of the landfill that have been affected by erosion and/or settlement, to create and maintain a continuously sloped surface sufficient to maintain positive drainage over and off the Site. The soil in the area of leachate seeps would be excavated and consolidated in the low areas. The resulting excavation would be backfilled and compacted with clay soils, effectively sealing the cover. The existing cover soil thickness should provide sufficient cut and fill material balance for these regrading activities. Off-site soils would be used, only if necessary. The Site would be graded to a minimum two percent slope and the side slopes would be no steeper than a slope of 4 times horizontal to 1 times vertical (4H:1V). The exception to this would be in the "old landfill" area next to Sequoit Creek, where some of the side slopes exceed 4H:IV. However, these slopes have been in place for at least 10 years, and will not be significantly affected by regrading. There are no signs of beginning slope failure, and the vegetation in these areas adds to the stability of the slopes. In the "new landfill" area, the existing side slopes range from 4H:1V to 6H:1V, and, therefore, should not hinder the regrading effort.

Appropriate erosion control measures to protect nearby Sequoit Creek and the adjacent wetlands would be implemented prior to construction activities. These measures may include construction of berms/silt fences, rip-rap and straw bale dikes, and use of temporary cover material.

After repairs to the soil cap are made, maintenance of the cap would include mowing at a minimum of twice per year, and quarterly perimeter ditch inspection and maintenance. Maintenance of the ditches would include removal of silt and debris. Quarterly inspections would include walking the Site and visually noting signs of erosion, settlement, or other damage. Noticeable, significant cover damage would be repaired. Although the majority of settlement on the Site has already occurred, additional differential settlement could occur as a result of continued or upgraded LFG and/or leachate extraction. However, any such settlement would be repaired by stripping soils, placing and compacting clay in the settled areas, and regrading the stockpiled soils as part of routine maintenance.

Infiltration would be reduced by over two inches per year (from 3.9 inches) by these cap improvements. Approximately 1.6 inches/year of infiltration would be expected following the implementation of this cap alternative. Table 16 summarizes the Hydrologic Evaluation of Landfill Performance (HELP) modeling results of the FS.

Construction would be expected to take approximately six weeks and may be completed in one construction season (May-October) with the following estimated cost:

- Capital Cost $1,370,000
- Annual O&M $72,000
- Total Present Worth (30 yrs @ 7%) $2,270,000

2. C2: Augmentation of the Existing Landfill Cap

This alternative involves using clay and cover materials from the existing cap to rework the cap over both the old and new landfill areas. The reworked cap would be constructed by stripping the existing soil cover, stockpiling the soils for later use, placing a two-foot compacted clay layer atop the entire landfill using on-site and off-site clay sources as necessary, and replacing the stockpiled soil in a two-foot uncompacted rooting zone/cover layer to support vegetation. The resulting dual layer cap would meet or exceed the final cover specifications embodied in 35 IAC 807. The additional two feet of material would help to facilitate the post-closure goal of minimizing future cap maintenance by providing an additional protective layer conducive to vegetative rooting.

Construction activities would include the removing vegetation; stockpiling of soils to be used as vegetation layer soils; consolidating the off-property waste at the northern edge of the "old landfill" onto Site property; regrading, placing, and compacting the clay soils; placing the uncompacted, vegetative layer soils; and re-establishing the vegetation. The existing landfill access roads are adequate; therefore, the construction of additional access roads is not included under this capping alternative. Construction activities would be planned at the landfill to avoid encroaching on or impacting the adjacent wetlands or floodplain.

The regrading of the Site will be performed to improve areas of the landfill that have been affected by erosion and/or settlement, to create and maintain a continuously sloped surface sufficient to maintain positive drainage over and off the Site. Recompaction of the cover would reduce infiltration of surface water by establishing a less permeable barrier layer. All work would be expected to be performed using existing on-site soils and supplemental off-site borrow soils. The Site would be graded to a minimum two percent slope and the side slopes would be no steeper than 4H:1V. The side slopes in the "old landfill" area next to Sequoit Creek, where some of the side slopes exceed 4H:IV, would require some amount of regrading to ensure slope stability following placement of the additional cover soils in these areas. The tops of the slopes would likely be pulled back, and the compacted clay and cover soils would be regraded on the reduced slopes. A detailed analysis of the slope regrading and reconfigurations would be part of the Remedial Design (RD) for the Site. In the "new landfill" area, the existing side slopes range from 4H:1V to 6H:1V, and, therefore, should not hinder the regrading effort.

Appropriate erosion control measures to protect nearby Sequoit Creek and the adjacent wetlands would be implemented prior to reworking the cap. These measures may include construction of berms/silt fences, rip-rap and straw bale dikes, and use of temporary cover material.

After the reworking of the soil cap, maintenance of the cap would continue to be required and would include mowing at a minimum of twice per year, and quarterly perimeter ditch inspection and maintenance. Maintenance of the ditches would include removal of silt and debris. Quarterly inspections would include walking the Site and visually noting signs of erosion, settlement, or other damage. Any damage would be repaired. Although the majority of settlement on the Site has already occurred, additional differential settlement could occur as a result of additional weight from reworking the existing landfill cover. However, no additional thickness of cover soils is planned to be placed; therefore, settlement would not be expected to be significant for this option.

Approximately 2.0 inches/year of infiltration would be expected following the implementation of this cap alternative. This infiltration value is greater than that of C1 because of the greater thickness of soil atop the compacted clay, allowing a greater volume of pore water to collect atop and eventually infiltrate through the compacted clay. See the Table 16 HELP model results for infiltration values.

Construction would be expected to take approximately 20 weeks and may be completed in one construction season (May-October) with the following estimated cost:

• Capital Cost	$4,925,000
• Annual O&M	$72,000
• Total Present Worth (30 yrs @ 7%)	$5,825,000

3. C3: Reconfiguration/Supplementation of the Existing Landfill Cap

This alternative includes using the soil materials from the existing cap as a "final protective layer" and using either existing on-site clay, supplemented as needed with off-site clay, or using entirely new off-site clay as a "low permeability layer." A cap that uniformly consists of a three-foot compacted clay layer, a three-foot uncompacted rooting zone/cover soil layer, and a vegetative cover would be constructed. The resulting cap would comply with the final cover specifications of 35 IAC 811, which require a low permeability layer with a minimum allowable thickness of three feet, overlain by a final protective layer not less than three feet thick, sufficient to protect the low permeability layer from freezing and to minimize root penetration.

Construction activities would include removing vegetation; stockpiling the cover soils for re-use as needed; consolidating the off-property waste at the northern edge of the "old landfill" onto Site property; re-grading the Site using existing soils to a uniform graded surface; excavating and hauling supplemental off-site clay to the Site; placing and compacting three feet of clay as the barrier layer; placing the rooting zone soils and topsoil layer; and re-establishing vegetation. A borrow-source investigation would be conducted to confirm the quality of off-site clay before it is excavated and used in the cap. The cap could be supplemented with clay from the previously used clay source (north of the "new landfill" area) if the clay is available in sufficient quantity and is of acceptable quality (to be determined by borrow-source testing).

Existing landfill access roads are adequate; therefore, construction of additional access roads is not included under this capping alternative. Construction activities could be performed so as not to encroach on or impact the adjacent wetlands or floodplain.

Regrading of the Site using existing cover soils would be performed to eliminate the erosional rills, gullies, and settlement depressions that affect approximately 20 percent of the Site area. This would create a continuously sloped surface sufficient to maintain positive drainage over and off the Site and would also reduce infiltration and the formation of leachate. Recompaction of the cover would reduce the infiltrating volume of surface water by establishing a less permeable barrier layer. The Site would be graded to a minimum two percent slope and to a maximum 4H:1V slope on side slopes, except at the property boundary where Sequoit Creek abuts the Site. The 4H:1V design criterion is intended as a generalized guidance for the cap and may have to be evaluated at the very edge of the property boundary in these areas. Although significant grading may be necessary to place the additional thickness of cover soils in the steep areas, these slopes appear to be in relatively good shape, and a detailed analysis would be conducted to determine the proper slope grades and configurations, since these areas would be regraded to install the cap upgrade.

Appropriate erosion control measures to protect nearby Sequoit Creek and the adjacent wetlands would be implemented prior to reworking the cap. These measures may include the construction of berms/silt fences, the placement of rip-rap, and straw bale dikes, or the use of temporary cover material.

After the reworking of the landfill cap, maintenance would continue to be performed and would include mowing at a minimum of twice per year and quarterly Site inspections. Quarterly inspections would consist of walking the Site and visually noting evidence of erosion, settlement, clogged swales, and/or other damage. Repair would be performed as needed. Maintenance of the ditches would include removal of silt and/or debris that may impair surface water flow. Additional differential settlement could occur after the reconstruction of the landfill cover as a result of the additional weight provided by the new cover soils; however, additional settlement would be addressed as part of the routine Site maintenance.

Approximately 2.2 inches/year of infiltration would be expected following the implementation of this capping alternative. Infiltration is greater through the C3 cover than that of the C2 cover because the thicker soil layer is able to retain more moisture, thus allowing a greater volume of pore water to infiltrate through the clay to the waste mass. See the Table 16 HELP model results for infiltration values.

Construction would be expected to take approximately 27 weeks and may need to extend over the course of two construction seasons, with the following estimated cost:

- Capital Cost — Up to $9,034,500
- Annual O&M — $72,000
- Total Present Worth (30 yrs @ 7%) — Up to $9,934,500

C. Landfill Gas Collection and Treatment Alternatives

1. G1: NFA

This alternative involves the continued use of the existing passive gas vent system at the Site. Repairs to the existing gas flares may be required in order to maintain the gas collection efficiency of the system. (See Figure 5 for the existing gas flare locations.) The following estimated costs are associated with using the existing gas collection system:

- Capital Cost — $231,000
- Annual O&M — $35,000
- Total Present Worth (30 yrs @ 7%) — $665,400

2. G2: Supplementation of the Existing Landfill Gas System

The existing passive flare system in the new landfill area, consisting of flares GWF1-GWF14 (see Figure 5), would be repaired as necessary, and continue to be operated. LFG collection and treatment would also be supplemented through the addition of an active system in the old landfill section, consisting of approximately five new vertical extraction wells, and use of the nine existing extraction points (LP1-LP4, and LP10-LP14; see Figure 5). The extraction points would be interconnected by header piping to a blower/flare station. A pilot/pre-design study would be undertaken to determine the necessary repairs to the existing passive flares in the "new landfill," viability of using the nine existing wells in the "old landfill," and optimal locations for placement of new wells in the "old landfill."

The installation of the new system in the "old landfill" area would require trenching in areas of the Site where header pipe placement is needed, the placement of header piping and installation of the new wells, backfilling, the reworking of the cap, and construction of the blower and flare station. Trenching work would be coordinated with the "new landfill" cap reconstruction, if performed.

The existing gas collection system consists only of passive vent points. These existing gas vent points will be raised or lowered, as necessary, concurrently with the cap repair or upgrade. Care will be taken when grading around these vent points, and grading will likely be done by hand in the immediate vicinity of the wells or vents, so that damage will be avoided or minimized.

After installation of the new system, operation, inspection, and maintenance would be required as described for alternative G3. The existing system in the "new landfill" area would also require inspection and maintenance. Construction activities would be staged so that they would not encroach on or impact the adjacent wetlands or floodplain.

Air monitoring will be performed in order to comply with the action-specific ARARs for landfill gas management, gas collection, and landfill gas processing and disposal identified in Table 13. Frequencies of monitoring, monitoring points, contaminants and indicators monitored, and the duration of monitoring will be covered during the RD.

Construction of this gas collection/treatment alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this gas collection/treatment alternative:

- Capital Cost $701,100
- Annual O&M $35,000
- Total Present Worth (30 yrs @ 7%) $1,135,500

3. G3: Active Site Upgrade of the Landfill Gas System

Existing stick flares (GWF1-GWF14) in the "new landfill" area would be converted to extraction wells, as necessary. See Figure 5 for flare locations. Existing vertical extraction wells in "old landfill" would be used, and additional wells in the "old landfill" would be installed, as needed. See Figure 5 for existing leachate extraction well locations. A header system would be installed that would interconnect all of the wells, including LP1-LP14, located throughout the landfill, to convey LFG to one centralized blower/flare station, forming an entirely active extraction and treatment system. As in the case of alternative G2, a series of pilot/pre-design studies would be conducted to determine the viability of using existing extraction points and to identify new extraction points, if any, which may be needed. The results of these pilot/pre-design studies may indicate that the fully active system proposed under G3 is not necessary, and that G2 is sufficient to address the LFG at the Site.

The implementation of this alternative would require trenching in areas of the Site for pipe placement, placement of pipe and new wells, placement of backfill around these new features, localized cap reconstruction, and construction of the blower and flare station. If cap reconstruction occurs, placement of piping would be coordinated with such work. Construction activities would be performed so they do not encroach on or impact the adjacent wetlands or floodplain.

This LFG system upgrade would allow LFG to be actively extracted from the waste mass, increasing the radius of influence (ROI) of each well to between 100 and 150 feet per well, which is typical for active municipal LFG extraction wells. The existing gas flare locations (GWF1-GWF14) are spaced approximately 200 feet apart, allowing for effective use of a 100 to 150 foot ROI after conversion to extraction wells. Approximately five new wells would be constructed in the "old landfill" area and one new well would be proposed for installation in the "new landfill" area to provide complete coverage. These new wells would have an approximate 35-foot depth and would be spaced approximately 200 feet apart. Approximately 12,000 feet of piping would connect all of the LFG extraction wells, and a blower and flare station would be constructed.

This active gas system, after installation, would require continual operation and regular maintenance. Inspections would be performed monthly to assure proper operation of warning lights, telemetry systems, and building vents. Measurements of valve settings, pressures and blower settings would be recorded. Routine maintenance and LFG monitoring would be performed as well.

This active LFG extraction/collection system could be constructed as part of a dual extraction system for leachate and gas. An additional feature of this option would be leachate extraction; therefore, the leachate collection portion of the dual extraction system is presented as leachate collection alternative LC4. See Figure 6 for a layout of this dual extraction system.

Air monitoring will be performed in order to comply with the action-specific ARARs for landfill gas management, gas collection, and landfill gas processing and disposal identified in Table 13. Frequencies of monitoring, monitoring points, contaminants and indicators monitored, and the duration of monitoring will be covered during the RD.

Construction of this gas collection/treatment alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this gas collection/treatment alternative:

• Capital Cost	$924,000
• Annual O&M	$35,000
• Total Present Worth (30 yrs @ 7%)	$1,358,400

D. Leachate Collection

1. LC1: NFA

This alternative would use the existing toe-of-slope collection pipes and leachate extraction manholes. See Figure 5 for existing piping and manhole locations. Collection of leachate would continue as is. The current leachate removal rate is about 1,000 gallons per day, according to WMII. The documented volume of leachate removed for 1997 was 63,000 gallons.

The following estimated costs are associated with this leachate collection alternative:

• Capital Cost	$0
• Annual O&M	$4,000
• Total Present Worth (30 yrs @ 7%)	$49,700

2. LC2: Toe-of-Slope Leachate Collection

This combination passive/active leachate collection alternative involves extending the existing leachate collection piping along the perimeter of the waste mass on both sides of the separation barrier between the "old and "new" landfill areas, and using the leachate extraction wells (P1, P2A, P3A, and P8-P10; see Figure 5) in the "new landfill" area. In the "new landfill" area, piping would be constructed along the north and south perimeters and would tie into the pipe which runs along the west side of the "new landfill" area into the east manhole (MHE). In the "old landfill" area, piping would be constructed along the north, south, and west perimeters that would tie into the pipe which runs along the east side into the west manhole (MHW). Approximately 4,200 feet of total piping would be placed. See Figure 5 for existing piping and manhole locations.

Construction of this alternative includes removal of the cap in areas of pipe placement, placement of backfill, relocation of excavated waste, and replacement of the cap. If cap reconstruction occurs, pipe placement would be coordinated with such work. Construction activities would be staged so that they do not encroach on or impact the adjacent wetlands and floodplain.

This alternative would increase leachate collection efficiency, reduce leachate levels near the toe of slope to eliminate seeps, and induce an inward gradient at the perimeter of the landfill, potentially capturing impacted shallow groundwater in the surficial sand aquifer in the vicinity of the Site. Extraction of leachate would continue via the leachate extraction wells in the "new landfill," and from MHE and MHW. In addition, the extraction points installed in 1993 (LP1-LP14) could be used. These 14 wells were constructed for leachate/gas extraction, if needed. See Figure 5 for existing leachate extracting devices.

After construction of the new piping, routine O&M activities would be performed. Inspections would be performed to assure proper operation of pumps and switches, and alarms and equipment maintenance would be done, as needed. Monitoring of leachate volumes and composition would also be performed.

Construction of this leachate collection alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this leachate collection alternative:

- Capital Cost $232,300
- Annual O&M $60,000
- Total Present Worth (30 yrs @ 7%) $976,900

3. LC3: Upgrade/Supplementation of Leachate Collection System

The toe-of-slope collection piping would be extended along the north and south perimeter of the "new landfill" only; existing extraction points in the "new landfill" would also continue to be used. A dual extraction system consisting of five new wells interconnected with existing wells

LP1-LP4 and LP10-LP14, and a header connected to a blower/flare station would be constructed in the old section of the landfill. A pilot/pre-design study would be conducted to determine the viability of using existing extraction points and to identify new extraction points, if any, which may be needed. This alternative would be considered in conjunction with the LFG alternative G2, because the required construction for each of these alternatives is similar (i.e., use existing systems with minor upgrades in the "new landfill" and install new wells in the "old landfill"). See Figure 5 for existing leachate extraction devices.

The work includes removal of the cap in areas of pipe placement, installation of additional leachate/gas extraction wells and header piping, backfilling, relocating of excavated waste, and re-installation of the cap. If cap reconstruction is performed, pipe placement and well installation would be coordinated with such work. Construction activities would be performed so that they would not encroach on or impact the adjacent wetlands or floodplain.

The "new landfill" area has six existing leachate extraction wells from which leachate can be pumped and discharged into a leachate holding tank. The collection pipe along the perimeter would act as a control measure to eliminate side slope seeps. This alternative would also induce an inward gradient at the perimeter of the Site to control and collect shallow groundwater in the surficial sand aquifer in the vicinity of the Site.

After the systems are constructed, inspection and O&M activities would be performed. For the "old landfill" area, inspections would be performed monthly for the gas and leachate systems to assure proper operation of warning lights, telemetry systems, building vents, pumps, and controls. The monitoring of valve settings, pressures, blower settings, and leachate volumes and composition would also be done. For the "new landfill" area, inspections would be performed monthly for the piping and pumps along with monthly monitoring of leachate volumes and leachate composition.

Construction of this leachate collection alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this leachate collection alternative:

• Capital Cost	$367,800
• Annual O&M	$72,000
• Total Present Worth (30 yrs @ 7%)	$1,261,300

4. LC4: Active Leachate Extraction

The toe-of-slope collection piping would be extended along the north and south perimeter of the "new landfill" only; existing extraction points in the "new landfill" would also continue to be used. A dual extraction system consisting of five new wells interconnected with existing wells GWF1-GWF14 and LP1-LP14, and a header connected to a blower/flare station would be constructed in the old section of the landfill. A pilot/pre-design study would be conducted to determine the viability of using existing extraction points and to identify new extraction points, if any, which may be needed. This alternative would be considered in conjunction with the LFG alternative G3, because the required construction for each of these alternatives is similar (i.e., use existing systems with minor upgrades in the "new landfill" and install new wells in the "old landfill"). See Figure 6 for a layout of this dual extraction system.

The work includes removal of the cap in areas of pipe placement, installation of additional leachate/gas extraction wells and header piping, backfilling, relocating of excavated waste, and reconstruction of the cap. Pipe placement and well installation would be coordinated with cap reconstruction, if performed. Construction activities would be performed so that they would not encroach on or impact the adjacent wetlands or floodplain.

The "new landfill" area has six existing leachate extraction wells from which leachate can be pumped and discharged into a leachate holding tank. The collection pipe along the perimeter would act as a control measure to eliminate side slope seeps. This alternative would also induce an inward gradient at the perimeter of the Site to control and collect shallow groundwater in the surficial sand aquifer in the vicinity of the Site.

After the systems are constructed, inspection and O&M activities would be performed. For the "old landfill" area, inspections would be performed monthly for the gas and leachate systems to assure proper operation of warning lights, telemetry systems, building vents, pumps, and controls. The monitoring of valve settings, pressures, blower settings, and leachate volumes and composition would also be done. For the "new landfill" area, inspections would be performed monthly for the piping and pumps along with monthly monitoring of leachate volumes and leachate composition.

Construction of this leachate collection alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this leachate collection alternative:

• Capital Cost	$439,000
• Annual O&M	$60,000
• Total Present Worth (30 yrs @ 7%)	$1,183,600

E. Leachate Treatment and Disposal

1. LT1: NFA, Continue To Discharge To A Licensed, Publicly Owned Treatment Works (POTW)

Under this alternative, leachate would continue to be discharged to the Fox River Water Reclamation District (FRWRD), which is a permitted POTW. The leachate would be pumped directly from the collection system and transported via tanker trucks to the POTW for treatment under an industrial discharge permit for the Site.

The following estimated costs are associated with this leachate collection alternative:

- Capital Cost $0
- Annual O&M $66,800
- Total Present Worth (30 yrs @ 7%) $829,000

2. LT2: Pretreatment and Discharge to a POTW

Under this alternative, leachate would be pretreated prior to discharge to the local POTW. Pretreatment may include chemical precipitation for metals removal and aeration to lower biochemical oxygen demand (BOD) concentrations. The leachate may or may not continue to be discharged to the currently-used POTW (FRWRD).

An on-site pretreatment facility would require the construction of a treatment building; installation of tanks, piping, gauges, valves, fittings, pumps, electrical controls, and meters; and connection of utility service to the building. Construction activities would not encroach on or impact the adjacent wetlands or floodplain.

This alternative would eliminate the hazards associated with overland transport of contaminated leachate to an off-site POTW, and would accommodate the increased volume of leachate associated with increasing leachate collection efficiency at the Site. The leachate collection alternatives presented previously are intended to bring about the reduction of leachate levels throughout the landfill.

Currently, approximately 1,000 gallons per day of leachate is pumped and transported to the POTW, according to WMII. The quantity of leachate removed would initially increase if an enhanced leachate collection system is installed at the Site. For this alternative, an initial increase in the extraction rate has been assumed. A permit from the local POTW would be required. The permit would specify the leachate constituent concentrations and acceptable leachate quantities that could be effectively handled by the POTW. The pretreatment facility would be designed and constructed to attain the pretreatment level required by the POTW. Monitoring would be performed at the frequency specified by the POTW to ensure compliance with the POTW's requirements.

After construction of this system, inspections would be performed on a monthly basis to ensure proper operation of pumps, switches, controls, warning lights, telemetry systems, and building vents. Maintenance, adjustments, and repairs to the system would be made as necessary.

Construction of this leachate treatment alternative can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with this leachate treatment alternative:

- Capital Cost $476,000
- Annual O&M $752,100
- Total Present Worth (30 yrs @ 7%) $9,809,600

3. LT3: Treatment of Leachate and Surface Discharge

This alternative involves treatment of leachate to meet surface water discharge standards. A combination of multiple treatment technologies would likely be required to provide the necessary level of treatment to reduce all of the leachate constituents to required levels.

An on-site treatment facility would require the construction of a treatment building; installation of tanks, piping, gauges, valves, fittings, pumps, electrical controls, and meters; and connection of utility service to the building. Construction activities would not encroach on or impact the adjacent wetlands or floodplain. O&M of the facility would require the services of a certified treatment plant operator for a minimum of 20 hours per week to operate and maintain the plant, and to perform the required monitoring.

A National Pollutant Discharge Elimination System (NPDES) permit would be required for this alternative. Leachate would be extracted at a rate sufficient to control the off-site migration. After treatment, leachate would be discharged to a surface water location of adequate assimilative capacity. Since adjacent Sequoit Creek is not suitable for discharge due to its low assimilative capacity, another, more remote surface discharge location would have to be identified for this alternative to be considered feasible. To demonstrate compliance with the NPDES permit requirements, monitoring at a frequency to be specified in the permit would be performed.

The treatment system would require continuous operation and ongoing routine maintenance. After construction of the system, inspections would, at a minimum, be performed on a monthly basis to assure proper operation of pumps, switches, controls, warning lights, telemetry systems, and building vents. Maintenance, adjustments, and repairs to the system would be made as necessary.

Construction of this leachate treatment alternative would require a significant effort, due to the pipeline construction to an adequate outfall location. Therefore, this alternative would likely extend over two construction seasons. The following estimated costs are associated with this leachate treatment alternative:

- Capital Cost $1,843,000
- Annual O&M $605,200
- Total Present Worth (30 yrs @ 7%) $9,353,600

F. Groundwater Monitoring

1. GW1: NFA, Continue Current Groundwater Monitoring

The existing groundwater monitoring program would be continued under the NFA alternative. As stated in the current IEPA Site permit, additional monitoring points would be established during the CERCLA RD process, and a formal monitoring program would be presented to USEPA and IEPA at that time. The groundwater monitoring frequency will be quarterly, in accordance with 35 IAC 811.319(a).

The following estimated costs are associated with the NFA groundwater monitoring alternative:

- Capital Cost $692,200
- Annual Cost $63,000
- Total Present Worth (30 yrs @ 7%) $1,474,000

To mitigate the potential adverse environmental impact posed by groundwater contamination identified in the RI, the nearest public well, VW4, was replaced with a new well (VW7) which is located more than one mile from the Site. The estimated capital cost for alternatives GW1 and GW2 include the already-incurred cost of $652,800 to remove VW4 from service and install VW7, and an estimated cost of $39,400 to abandon VW4.

2. GW2: Monitored Natural Attenuation

Under this alternative, in addition to the continuation of the groundwater monitoring program, a groundwater monitoring plan would be implemented to assess the effectiveness of natural attenuation to reduce the contaminant impacts to groundwater. The groundwater monitoring program would include monitoring the quality of groundwater from both the surficial sand and the deep sand and gravel aquifers. To further study the extent, if any, of a groundwater contaminant plume, a pre-design investigation will also be conducted. The pre-design investigation will consist of installing and monitoring approximately two wells downgradient of well US3D, and analyzing the groundwater samples.

A groundwater management zone (GMZ) in accordance with 35 IAC 620.250 cannot be established because a contaminant plume requiring corrective action has not been identified. In the event that a contaminant plume is discovered in the future, the need for establishing a GMZ would be reevaluated. Wells to be monitored would be selected based on the RI analytical results and well locations relative to known groundwater flow directions (generally west along Sequoit Creek and in the surficial sand aquifer, and southwest in the deep sand aquifer). Wells located along the south and southwest perimeter of the Site would be likely candidates for inclusion in the groundwater monitoring plan.

The upgradient monitoring wells (G14S, G14D, G11S, and G11D) and the selected downgradient monitoring wells include wells which are screened in the surficial sand aquifer and wells which are screened in the deep sand aquifer at the Site. Monitoring wells US3D, US4D, and W3D form a linear downgradient monitoring network which is screened in the deep aquifer. Periodic sampling from this network of wells would be performed to gauge the effectiveness of remedial measures and document groundwater conditions in the vicinity of the Site. As groundwater contaminant conditions continue to be evaluated during the 30-year O&M period, monitoring wells and/or private wells may be added to the groundwater monitoring well network. See Figure 7 for a layout of the likely monitoring points for this groundwater monitoring alternative.

The selected monitoring wells would be sampled on a quarterly basis for 30 years, in accordance with 35 IAC 811.319(a)(1)(A), and groundwater samples would be analyzed for the current list of analytes, including boron, chloride, iron, ammonia nitrogen, total dissolved solids, and zinc; as well as for the Illinois Pollution Control Board Groundwater Quality Standards list of contaminants shown in Table 22. The list of contaminants to be monitored must satisfy the requirements of 35 IAC 811.319(a); however, the owner or operator may request USEPA to reduce the list of contaminants to be monitored, according to 35 IAC 811.319(b)(5)(E).

According to 35 IAC 811.319(a)(3)(C), VOCs are to be monitored yearly. However, for the first five years of monitoring, VOC groundwater monitoring frequencies will be quarterly, due to the VOC contamination present in the groundwater. After the first USEPA Five Year Review, USEPA may approve a reduced monitoring frequency based on a review of the VOC groundwater monitoring data.

In addition, natural attenuation parameters would be monitored in select groundwater monitoring wells, specifically near the southwest corner of the Site. These parameters would include: total organic carbon, BOD, nitrate nitrogen, nitrite nitrogen, total kjeldahl nitrogen, orthophosphate, sulfate, conductivity, alkalinity, dissolved oxygen, pH, temperature, and redox potential. Additional natural attenuation parameters will be considered, and may be proposed in the monitoring plan to be developed during the RD phase. The monitoring program would be capable of recording changes in groundwater contaminant concentrations over time.

Installation of approximately two wells for the pre-design investigation can be completed in one construction season, and can occur concurrently with the cap restoration. The following estimated costs are associated with monitored natural attenuation:

• Capital Cost	$723,600
• Annual Cost	$69,700
• Total Present Worth (30 yrs @ 7%)	$1,588,600

VIII. Summary of Comparative Analysis of Alternatives

The remedial alternatives developed in the FS were evaluated on the basis of the nine evaluation criteria listed below. The advantages and disadvantages of each alternative were then compared to determine which alternative provides the best balance among the nine criteria. The nine evaluation criteria are set forth in the NCP, 40 CFR Part 300.430(e)(9)(iii). Each of the nine criteria is either a threshold criterion, primary balancing criterion, or modifying criterion.

A. Threshold Criteria:

1. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment refers to whether an alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)

Applicable requirements are those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental siting law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well-suited to the Site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Compliance with ARARs refers to whether an alternative will attain ARARs under federal environmental laws and state environmental and facility siting laws, or provide a basis for a waiver. Federal and state ARARs are divided into three categories: chemical-specific, action-specific, and location-specific.

B. Primary Balancing Criteria:

3. Long-term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes consideration of adequacy and reliability of controls.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

   Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies for the remedy.

5. Short-Term Effectiveness

   Short-term effectiveness refers to the potential adverse effects that implementation of an alternative may have on human health and the environment, during construction and before cleanup levels are achieved. The length of time needed to complete the remedy is also evaluated.

6. Implementability

   Implementability refers to the technical and administrative feasibility of an alternative, including the availability of services and materials.

7. Cost

   Cost includes estimated capital and long-term O&M costs for an alternative, and also is expressed as net present worth cost.

C. Modifying Criteria:

8. State Acceptance

   State acceptance indicates whether the State of Illinois supports the selected remedy, and includes key concerns the State of Illinois may have about the selected remedy and other alternatives.

9. Community Acceptance

   Community acceptance refers to the community's acceptance of the preferred alternative presented in the Proposed Plan based on comments received during the public comment period. The Responsiveness Summary, which is Appendix A of this ROD, contains significant comments received during the public comment period and the USEPA response to those comments.

The following discussion summarizes the compliance of the alternatives with the nine criteria.

1. **Overall Protection of Human Health and the Environment:**

Capping:

The BLRA demonstrated that the only carcinogenic risk to human health and the environment greater than 1×10^{-4} associated with the Site is that posed by the ingestion of vinyl chloride-contaminated water from the off-site deep sand and gravel aquifer. Repairs to the cap would not further reduce the specific risk posed by vinyl chloride since a repaired cap would not directly mitigate the current possibility of ingestion of vinyl chloride from the off-Site deep aquifer. The goal of a waste cap is to provide adequate protection to human health and the environment by preventing dermal contact with landfill contents, reducing contaminant leaching to groundwater, controlling surface water runoff and erosion, and reducing the potential for direct inhalation of LFG by providing increased containment of LFG.

The capping portion of the NFA alternative includes no capital costs associated with improving the cap, but does include minimal O&M activities to maintain the cap over the 30-year O&M period. The planned activities would not fully protect human health and the environment from dermal exposure to contaminated soil, and would allow excessive infiltration through the cap into the waste mass, thereby only minimally controlling contaminant leaching to groundwater. The capping improvements of the NFA alternative also would do little to control surface water runoff and erosion, due to the lack of capital improvements and minimal maintenance activities. Since the capping improvements would result in only a modest containment system, they would not significantly reduce the potential for direct inhalation of LFG.

The cap improvements prescribed under alternatives C2 and C3 would not further reduce the current risk of ingesting vinyl chloride-contaminated water from the deep sand and gravel aquifer because improvements would not eliminate this ingestion pathway. Significantly augmenting the existing cap structure could increase environmental threats posed by LFG. A much "tighter" cap could increase the rate of partitioning of LFG constituents into leachate and groundwater, thus elevating the potential level of risk associated with the Site. As a result, alternatives C2 and C3 would elevate risk levels above those associated with alternative C1. Alternative C3 would be the "worst case" alternative for this reason; also, alternative C3 could introduce further risks because it would involve the manipulation of cover materials on a much larger scale than the other two alternatives.

Benefits provided by alternatives C2 and C3 would include preventing direct contact with landfill contents, reducing contaminant leaching to groundwater, and controlling surface water runoff; however, all of these benefits could be achieved by making simple repairs to the cap as described under alternative C1. Reworking the existing cover for both alternatives C2 and C3 would involve regrading of the Site prior to recompaction of the barrier layer of the cap and placement of the cover soils. Both alternatives would reduce rainfall infiltration through the cap slightly less than alternative C1 (an estimated maximum infiltration of approximately 2.0 inches per year and 2.2 inches per year for Alternatives C2 and C3, respectively, compared to 1.6 inches per year for alternative C1), as shown by the HELP model results in Table 16, and ultimately would reduce leachate head levels within the waste mass. The infiltration values for these cap alternatives are higher than that of the C1 alternative because the added thickness of soil on top of the compacted clay results in a higher volume of pore space water available to infiltrate through the clay.

Since a portion of the Site was constructed with the base of the landfill below the water table, reduction of infiltration alone will not prevent leachate generation. Therefore, a balance between the capping alternative and the leachate collection alternative must be considered when selecting the Site remedial components. According to the HELP model results, capping alternatives C2 and C3 do not reduce infiltration more than C1, and because of the zone of saturation, leachate generation and collection will be required regardless of what cap alternative is selected. Therefore, the additional disturbance necessary to construct C2 and C3 cap alternatives and the increased infiltration through these caps make these alternatives less protective of human health and the environment than alternative C1.

Gas Collection and Treatment:

The risks posed by LFG from the Site are attributable to the potential for direct inhalation of LFG and partitioning of LFG constituents, including vinyl chloride, to groundwater. However, the RME excess lifetime cancer risks attributable to inhalation of VOCs from the ambient air at the Site falls below the USEPA 1×10^{-6} lower threshold and are therefore considered acceptable. (The calculated risks for child or teenage trespassers, and for nearby, adult residents are 4×10^{-9} and 5×10^{-7}, respectively, as summarized in Table 10.)

Alternative G1 proposes using the existing passive gas vent system for the entire landfill. This system has been demonstrated over time to be marginally effective in venting and flaring LFG, but is not totally effective due to flare blow-out and corrosion of the vent/flare stacks. If the system is used as originally intended (venting and flaring the LFG on a consistent basis) and is properly maintained, the existing passive system reduces risk to human health and the environment by preventing inhalation of vapors and controlling migration of LFG.

Alternative G2 provides for active extraction of LFG in the "old landfill" area only. The "new landfill" area would continue to use the existing system, following necessary repair of the existing wells and stick flares. If the existing system in the "new landfill" area were used as originally intended and maintained, coverage and efficiency in the "new landfill" area would be provided, along with increased protection from LFG migration or inhalation of vapors. Operation of the existing system in the "new landfill" and a new active system in the "old landfill" area would reduce risk to human health and the environment. This alternative could also be implemented with leachate collection alternative LC3, which involves installation of an active leachate collection system in the "old landfill."

Alternative G3 proposes an active gas extraction system with a treatment flare for the entire landfill. This alternative assumes each installed well has a radius of influence of between 100 and 150 feet, and therefore provides adequate Site coverage. LFG would be collected by the wells and piping, and would be discharged to a flare system for destruction. This alternative meets the remedial action objectives and reduces risk to human health and the environment by preventing inhalation of vapors and controlling migration of LFG. This alternative would provide the added benefit of further reducing the concentrations of VOCs in the leachate by removing them before they partition into the liquid phase. It could also be integrated with leachate collection alternative LC4 through the installation of a dual extraction system.

Leachate Collection:

Alternative LC1 would use the existing collection pipes and leachate extraction manholes. Collection of leachate would continue as is, with approximately 1,000 gallons per day (gpd) removed from the landfill. This alternative would not provide additional leachate collection, and would not directly address leachate seeps from the landfill side slopes. However, based on the results of the BLRA, the leachate seeps do not pose an unacceptable risk to human health or the environment.

LC2 extends the existing toe-of-slope leachate collection piping in both the "old" and "new landfill" areas. The extended toe-of-slope drains would be installed several feet below the soil cover/waste interface, but would not be installed at the base of the waste. The object of this system would be to maintain the "leachate maintenance level" in accordance with the existing IEPA permit. These additional collection pipes, in conjunction with a repaired or upgraded cap, would actively control leachate seeps on the side slopes of the facility.

Alternative LC3 proposes extension of the existing toe-of-slope collection piping and use of the existing leachate extraction wells in the "new landfill" area. In addition, five new leachate extraction wells (to be installed as part of this alternative) and the existing leachate piezometers, if necessary, will be used for leachate extraction in the "old landfill." Leachate levels within the "new landfill" area would not be expected to significantly decrease under this alternative, although they would be maintained at or below the "leachate maintenance level" noted above. This would achieve containment by inducing an inward gradient, which is consistent with the original design of the Site.

Alternative LC4, active extraction of leachate, provides a system in both the "new landfill" and "old landfill" to actively pump leachate from the entire waste mass. By actively extracting leachate from within the waste mass and maintaining an inward gradient, shallow groundwater in the immediate vicinity of the landfill perimeter would be captured. This active system would increase leachate collection volumes and control leachate head levels within the Site. By reducing head levels and maintaining the "leachate maintenance level" within the waste mass, the potential for leachate migration would be reduced, and the potential impacts due to infiltration through the cap would be minimized. Capture and control of shallow groundwater from the on-site surficial sand aquifer would result in an increased margin of safety for protection of human health and the environment.

Leachate Treatment:

Alternative LT1 is currently operational at the Site. The leachate is pumped directly from the collection manholes, stored in a tanker truck, and transported to a POTW for treatment under an industrial discharge permit for the Site. This alternative is protective of human health and the environment, provided the leachate is discharged to the POTW in accordance with the industrial discharge permit.

Alternative LT2 proposes to pretreat leachate on-site prior to discharge to a POTW. The leachate would be pretreated to remove and/or reduce the concentrations of various constituents as required by the POTW (potentially BOD and metals, for example). The POTW would receive the treated water and complete the removal and/or reduction of concentrations of the remaining contaminants. This alternative would be protective of human health and the environment.

Alternative LT3 proposes construction of an on-site leachate treatment facility that would use various treatment technologies required to treat leachate to meet surface water discharge standards as required by a NPDES discharge permit. LT3 would protect human health and the environment, provided the NPDES limits were not violated.

Groundwater Monitoring:

Groundwater monitoring alternative GW1 is a long-term monitoring program that will provide warning of a potential change in contaminant conditions that could impact public or private wells. Groundwater monitoring alternative GW2 provides an additional measure of protection by monitoring the effectiveness of the natural attenuation processes. In addition, a pre-design investigation, consisting of one or two additional monitoring wells, would be implemented as part of GW2. Both monitoring programs would be capable of recording changes in groundwater contaminant concentrations over time and would provide an early warning system to effectively reduce the risk of future exposure of residents to impacted groundwater. Both monitoring programs would also be effective in demonstrating the effectiveness of source control measures implemented at the H.O.D. Landfill.

2. Compliance with ARARs:

The requirements of 35 IAC 807 are applicable to the Site. The H.O.D. Landfill is classified as a municipal solid waste landfill as defined in 35 IAC 810.103, because it received waste before October 9, 1993. It received an operating permit under 35 IAC 807, and was closed in 1989 under 35 IAC 807. Under 35 IAC 814.101(b)(3), the Site is required to comply with the terms of its existing permit under 35 IAC 807, along with any relevant additional requirements specified in Appendix A of 35 IAC 814.

The requirements of 35 IAC 811 are relevant to the Site. These are the requirements currently applicable to municipal solid waste landfills in Illinois. Certain requirements of 35 IAC 811 are also appropriate to address conditions at the Site, as components of an integrated remedy which combine ARARs under 35 IAC 807 and 35 IAC 811. Those relevant and appropriate requirements of 35 IAC 811 which are ARARs for the selected remedy are identified in the following narratives for each component. The narratives also identify additional ARARs for the components.

Capping:

ARARs that apply to capping alternatives involve protection of the floodplain, wetlands, and surface waters, and compliance with 35 IAC 807 capping and 811.111(c) post-care requirements. Capping alternatives C1, C2, and C3 all comply with the applicable State 35 IAC 807 requirements by providing cover design and performance to include, at a minimum, a two-feet thick low-permeability layer of compacted soil overlain by adequate cover soils to minimize erosion and maintenance requirements. Alternatives C1 and C2 also comply with the relevant and appropriate 35 IAC 811.111(c) post-closure requirements, since they include the 30-year O&M described in the 811.111(c) ARAR. Alternative C3, by definition, complies with the 811.111(c) post-closure requirements. All of the alternatives would involve erosion control and staged construction activities such that the adjacent wetlands and floodplain would be protected.

Gas Collection and Treatment:

The State of Illinois, under 35 IAC 811.311, establishes minimum requirements for gas venting and collection systems to ensure the protection of human health. The State has promulgated specific air emission standards for LFG venting and gas collection systems. State of Illinois regulations (35 IAC Part 218) require that VOC emissions from the Site must not exceed 25 tons/year, because the Site is located in an ozone non-attainment area. Other pertinent State of Illinois air emission standards regulate particulate matter, sulfur, organics, carbon monoxide, nitrogen oxides, and hydrogen sulfide (35 IAC Parts 212 - 217). There are also general provisions for the control of gas emissions.

Alternative G1 would comply with the above-mentioned ARARs only if the existing system was repaired so that it could be operated as originally intended, and maintained so that it could be operated continuously. This alternative, because it relies on dated technology (passive stick-type flares), may not be as efficient at managing LFG emissions.

Alternative G2, which combines the dated, passive stick flare technology in the "new landfill" area, and an active system in the "old landfill" area, would potentially meet the ARARs if the "new landfill" system was repaired and maintained so that it could be continuously operated. However, the dated technology used in the "new landfill" may not be as efficient for controlling LFG emissions.

Alternative G3 satisfies the accepted presumptive remedy objectives for landfill gas management, which are gas collection and treatment. This alternative would satisfy 35 IAC 212 through 218 and 811.311 ARARs through active gas control and treatment, and would include monitoring to ensure continued compliance.

Leachate Collection:

The State of Illinois requirements for landfill leachate collection systems, 35 IAC 811.308, include specifications and design criteria to prevent threats to human health and the environment from leachate releases. Although the BLRA indicates that risks posed by leachate seeps at the Site are not unacceptable, these leachate seeps violate 35 IAC 807 or 35 IAC 811 requirements. Therefore, LC1, which includes the current practice of scheduled manual extraction of leachate from the existing collection pipes and extraction manholes, would not directly address the identified leachate seeps and thus may not comply with ARARs.

LC2, which would add the toe-of-slope leachate drains, would actively control the leachate seeps; however, the potential for leachate breakouts or migration to the groundwater due to the volume of leachate remaining in the landfill would still be present. LC2, therefore, would be questionable with regard to ARAR compliance.

LC3, which would use both automated and manual methods to control leachate, partially complies with the ARARs because the potential for leachate seeps in the "new landfill" is eliminated, but the potential for migration to groundwater in the "new landfill" would still exist.

LC4, active collection of leachate from the entire landfilled waste mass, would comply with ARARs by eliminating the potential for leachate seeps, and by significantly reducing the likelihood of leachate migration to the groundwater.

Leachate Treatment:

The 811.309 ARARs listed in Table 13 are associated with all leachate treatment alternatives involving prevention of leachate release to groundwater or surface water. All three alternatives, if properly implemented, would comply with the general requirement to prevent discharge of leachate to groundwater or surface waters such that threats to human health and the environment are eliminated. In addition, alternatives LT1 and LT2 would comply with the applicable sewer discharge criteria and POTW pretreatment standards, if properly implemented.

LT3 would be required to comply with the Clean Water Act, use best available technology to control pollutants, and properly operate the discharge system, including monitoring, maintenance, analyses, and establishment of effluent standards. Alternative LT3 includes the complete treatment and discharge of leachate to surface waters. Such treatment, if properly implemented, would comply with State and Federal ARARs.

Groundwater Monitoring:

35 IAC 811.319(a) and 811.318 apply to the groundwater monitoring alternatives. Both alternatives GW1 and GW2 meet the minimum groundwater monitoring requirements and thus

comply with applicable ARARs. Should the owner or operator demonstrate that reduced monitoring is sufficient to protect human health and the environment, USEPA may be petitioned for a reduction in monitoring according to 35 IAC 811.319(a). However, USEPA may reinstate increased monitoring if a statistically significant increase is determined according to 35 IAC 811.319(a).

35 IAC 620.250, which requires establishment of a GMZ, does not apply because a coherent contaminant plume requiring corrective action has not been identified. However, compliance with Illinois Groundwater Quality Standards at 35 IAC 620.410 will be monitored, and the effectiveness of source control actions in achieving the groundwater quality standards will be documented.

3. Long-term Effectiveness and Permanence:

Capping:

Alternatives C1, C2, and C3 address long-term protection by controlling stormwater infiltration into the landfill, thus decreasing the potential for contaminant transport into the leachate and groundwater. These alternatives, which combine both access restrictions and improved covers, would prevent direct contact with landfill contents. They would also minimize future erosion and control surface water runoff by implementation of the maintenance plan described for each alternative. The soil cover of each of the alternatives can last indefinitely if correctly maintained.

Gas Collection and Treatment:

Alternative G1, if maintained and operated continuously, could potentially provide long-term effectiveness. Over the years, LFG generation would decline and the LFG extraction system, if maintained, would continue to perform. The "old landfill" portion of the Site is approximately 30 years old and gas generation is likely declining. The "new landfill" portion of the Site is approximately 13 years old. LFG generation in this area of the Site is also declining, although it remains greater in this area than in the "old landfill." If the existing system were repaired and operated continuously, LFG in both areas could potentially be effectively controlled by this alternative. However, the existing system, as it is currently operating, does not provide long term effectiveness and permanence.

Alternative G2, because of the use of the passive stick flare technology in the "new landfill" area, would potentially provide reduced long-term effectiveness, because there is evidence that the existing passive system used for LFG control in the "new landfill" area is not controlling landfill gas completely, and the "new landfill" area would be producing a greater quantity of LFG for a longer period of time than the "old landfill" area. However, if the existing system were repaired and operated continuously, this alternative would potentially control LFG emissions from the Site.

Alternative G3 provides increased long-term effectiveness. This alternative provides active extraction of LFG, thereby reducing the VOC concentrations within the waste mass. This active system uses Reasonably Available Control Technology (RACT) for control of LFG, and would be effective at eliminating LFG emissions from the Site.

Leachate Collection:

Alternative LC1 would not collect more leachate than is now being collected. Therefore, the increased effectiveness of this alternative for controlling leachate seeps and migration to groundwater would be minimal.

Alternative LC2 would result in an increase in leachate collection quantities in the short term and in the long term, if properly maintained. The leachate mound within the waste mass would likely remain, although the potential for seeps would be minimized. This alternative would be somewhat effective in the long-term for minimizing leachate migration to groundwater.

Alternative LC3 also represents an increase in long-term effectiveness, because leachate levels would be controlled within the waste mass in the "new landfill" area. Furthermore, the leachate levels are expected to remain in conformance with the requirements of the IEPA permit for the Site. However, the minimization of leachate migration to groundwater is not generally addressed by this alternative.

Alternative LC4 would increase leachate collection quantities in the short term, and if maintained, should continue to operate effectively for many years. This increased leachate extraction would reduce leachate levels in the landfill and control the formation of leachate seeps. The reduction of leachate volume within the waste mass would serve to minimize the potential for migration of leachate to groundwater.

Leachate Treatment:

If properly maintained, any of the leachate treatment alternatives would provide long-term, effective leachate treatment.

Groundwater Monitoring:

Both monitoring programs will be effective in measuring the long-term effectiveness and permanence of the required source control actions. Changes in groundwater quality will be monitored over time and would provide early notice of any change in groundwater quality. The GW2 alternative would provide better indicators of the effects of natural attenuation; therefore, GW2 is considered to offer better long-term effectiveness than GW1.

4. **Reduction of Toxicity, Mobility, or Volume through Treatment:**

Capping:

Capping alternatives do not involve treatment and therefore are not evaluated against this criterion.

Gas Collection and Treatment:

All of the alternatives reduce the volume of LFG via combustion. Alternative G1 uses the existing stick flares. These flares can be adversely affected during periods of low gas flow or under high winds. Keeping these flares lit requires increased monitoring and O&M. G2 uses a combination of passive and active control for LFG, incorporating both the benefits of an active system and the increased maintenance issues associated with G1. Alternative G3 would use an active system to collect LFG from the entire waste mass and would feature combustion at a single point flare, allowing for less labor-intensive O&M. Reduction in toxicity through treatment would be addressed by G1, G2, and G3, provided the flares would stay lit. However, any of the alternatives could allow for periods of time when flares become extinguished and LFG can escape uncontrolled. Alternative G3 is the most effective at reducing toxicity, mobility, and volume of LFG because of its fully active feature.

Leachate Collection:

The leachate collection alternatives do not involve treatment; therefore, they are not evaluated against this criterion.

Leachate Treatment:

Each of the leachate treatment alternatives reduces the toxicity of the leachate by reducing and/or removing the contaminants of concern. Metals would possibly remain as a treatment by-product (sludge or concentrate) to be disposed of appropriately. These metals would appear in the POTW sludge or in the on-site treatment system sludge. Toxicity would be reduced for the majority of the contaminants, and for metals, the mobility and volume of contaminants would be significantly reduced.

Groundwater Monitoring:

The groundwater monitoring alternatives do not involve treatment; therefore, they are not evaluated against this criterion.

5. Short-Term Effectiveness:

Capping:

The potential short-term impacts on the community, environment, and construction workers during Site construction activities were evaluated. These potential impacts include noise, dust, erosion, dermal contact with waste, and increased truck traffic. Construction activities for each alternative would be performed in accordance with USEPA-approved health and safety plans.

Alternative C1 would have relatively low short-term construction impacts. These impacts may include additional noise and dust generation due to soil relocation/placement during cap regrading and waste consolidation. Since this alternative would primarily involve regrading and recompacting areas of the upper layer of the existing cap, dermal contact with the waste mass should not be a concern. Potential dermal contact with the waste mass would be minimized through the use of personal monitoring and protective equipment (if necessary). Equipment decontamination would be implemented, thus further reducing the potential concern for dermal contact.

Noise levels increase during construction; however, noise can be minimized by maintaining noise control devices on construction equipment. Wearing hearing protection can also reduce the effects of heavy machinery noise on Site workers. Fugitive dust emissions would occur during construction; however, measures can be taken to minimize the amount of dust generated by the watering of construction areas and roads, and by the potential use of dust masks by Site workers. Additionally, erosion control measures and protection of Sequoit Creek from construction-related sedimentation would be conducted during construction and thereafter, as needed. Alternative C1 would take approximately six weeks to construct, based on moving approximately 6,000 cubic yards of material per day for five days per week.

Alternative C2 would also have relatively low short-term construction impacts. These impacts would be similar to those of the C1 alternative, described above. This alternative would take approximately 20 weeks to construct based on moving approximately 6,000 cubic yards of material per day for five days per week. Since this alternative would take significantly longer than C1, it does not offer as much short-term effectiveness.

Alternative C3 would have some short-term construction impacts, including increased dust, noise, and the potential for dermal contact with waste. As stated above for alternative C1, measures can be taken to minimize all of these construction impacts. This alternative may also involve importing supplemental clay to complete the compacted clay cap. Therefore, an increase in truck traffic, noise, and dust generation could be expected during the construction period, which could affect nearby community roads. Construction is expected to take approximately 27 weeks and would likely extend over the course of two construction seasons. If a clay borrow site is needed, it would also have short-term construction impacts requiring dust control, noise control, erosion control, and surface water management. These impacts would be addressed using the same measures outlined above to minimize impacts at the Site. Due to the greater implementation time and volume of material needed, this alternative offers the least amount of short-term effectiveness.

Gas Collection and Treatment:

The potential short-term impacts from alternative G1 include minimal disturbance of the Site during repairs to the existing system. Both G2 and G3 involve the installation of LFG header piping and the potential installation of additional gas extraction wells and a blower/flare station. This work would result in an increase of noise, dust, and the potential for dermal contact with waste by construction workers. Measures can be taken to minimize dust and noise, as previously discussed. Personal protective equipment and decontamination of equipment can reduce the potential for dermal contact and inhalation.

Leachate Collection:

Because LC1 uses the existing system, no short term impacts are anticipated. Alternatives LC2, LC3, and LC4 would result in increased noise and dust during construction. In addition, the potential exists for construction workers to have dermal contact with contaminants. Personal protective measures can be taken to minimize these impacts, as discussed previously.

Leachate Treatment:

LT1 would require no additional disturbance of the Site, although the loading and transport of leachate would present noise and dust. Alternatives LT2 and LT3 could result in increased noise and dust during construction. Measures could be taken to minimize these impacts; for example, watering for dust control, the installation and maintenance of noise control devices on machinery, wearing noise protection equipment, and wearing of dust masks.

Groundwater Monitoring:

There is no current risk to workers attributable to exposure to groundwater. Alternative GW2 poses a greater short-term risk to workers than GW1, because of the installation of pre-design investigation wells.

6. Implementability:

Capping:

Alternatives C1 and C2 would require the coordinated work of an earthwork contractor with a landscape subcontractor. Alternative C1 could be implemented with a minimum of earthwork activity, limiting the activity to the low areas of the Site only. Alternative C2 would require more disturbance of surface soils, and therefore more earthwork and compactive effort. Under either alternative, off-site materials are not expected to be required to complete the cap construction. Earthwork contractors with landfill capping experience are readily available in the area of the Site. An agreement with the adjacent property owner would be necessary for access to consolidate the off-property waste at the northern edge of the "old landfill" onto Site property. Both C1 and C2 could be implemented in one construction season.

Alternative C3 would involve the coordinated work of an earthwork contractor with a landscape subcontractor. A clay source would likely be required which can provide clay meeting the quantity needs and quality specifications established for the Site. Approximately 103,000 cubic yards of quality clay meeting the maximum permeability of 1×10^{-7} centimeters per second (according to 35 IAC 811) would be required to construct a three-foot thick barrier layer. Prior to transporting off-site clay, weight restrictions and other local road requirements would be evaluated. An agreement with the adjacent property owner would be required for access to consolidate the off-property waste at the northern edge of the "old landfill" onto Site property. C3 may require two construction seasons to implement the entire capping remedy.

Gas Collection and Treatment:

Alternative G1 has already been implemented and would not require additional work beyond repair of existing vents, where necessary, and typical upkeep and periodic replacement of the existing vents and flares (as needed). O&M activities (inspections of flares) for this LFG system are many and frequent; however, they are easily performed.

Alternatives G2 and G3 would involve coordination of earthwork contractors and gas extraction system installation specialists. Materials required for the LFG system construction (piping, blower, flare, fittings, etc.) are readily available, as are the qualified contractors and subcontractors needed to perform the work. O&M activities (inspections of flares, settings, controls, telemetry systems) for these LFG systems are required; however, they are also easily performed.

Leachate Collection:

The equipment used for LC1 already exists, and therefore this alternative would be easily implemented. Existing wells and manholes would continue to be used, and upgrades or repairs to these components would be easily made, if necessary.

LC2 would require the installation, via trenching and possible excavation, of corrugated, perforated piping at the toe of the landfill slopes. This activity is a standard construction technique and would be readily implemented. Coordination with an earthwork contractor and potentially a subsurface utility contractor (for yard piping) would be required. Materials necessary for the installation are readily available in adequate quantities.

LC3 would require installation of wells, installation of header piping, and construction of a blower and flare system in the "old landfill." Coordination of earthwork, mechanical, and electrical contractors, as well as other utility contractors, would be necessary. Materials necessary to construct these components (wells, piping, pumps, fittings, blower, instrumentation, etc.) are all readily available. O&M activities (inspections of pumps, fittings, controls, telemetry systems, and monitoring of leachate volume) would all be necessary and are all easy to perform.

LC4 would require construction similar to LC3, although it would be implemented in both the "old landfill" and "new landfill." Therefore, coordination of contractors and use of materials similar to those used for LC3 would be necessary, but on a larger scale. Materials and labor necessary to construct this alternative are readily available in sufficient quantity. O&M of this alternative would be similar to that for LC3, but on a larger scale.

Leachate Treatment:

LT1 would be easily implemented, as the existing treatment is conducted at a POTW following transport from the Site. The existing pumps could be used, and a tanker truck would be required to periodically transport the leachate. The tanker truck is already in use.

LT2 would require the construction of a pretreatment plant and ongoing monitoring to verify that required pretreatment standards are met. This pretreatment alternative would require an on-site treatment facility be constructed and treatment chemicals be maintained on-site. In addition, continued O&M of the pretreatment facility would be necessary.

LT3 would also require construction, management, and O&M of a leachate treatment plant. An NPDES permit would be required before the leachate treatment system could begin operation and discharge of treated leachate to a surface water body of adequate assimilative capacity. O&M of this type of treatment plant would be intense and continual, and would require ongoing monitoring. In order to implement LT3, easements and rights-of-way would have to be obtained to construct the required piping from the treatment facility to the selected discharge point. Special property access rights would also have to be obtained, making this alternative the least implementable of the three.

Groundwater Monitoring:

Both groundwater monitoring programs are readily implementable. The GW2 alternative involves the addition installation of pre-design investigation wells.

7. Cost:

Table 15 summarizes capital costs, O&M costs, and present worth values for each alternative. A discount rate of seven percent is used, consistent with OSWER Directive No. 9355.3-20.

Capping:

Alternative C1 is estimated to cost approximately $2.3 million dollars, and reduce infiltration by approximately 2.3 inches per year (to approximately 1.6 inches per year). Alternative C2 will cost approximately $5.8 million dollars, and only reduce infiltration by 1.9 inches per year (to 2.0

inches per year). If C2 was implemented, the additional $3.5 million over C1 would allow more infiltration due to additional pore space water. C3 will potentially cost from $7.6 to $9.9 million dollars, depending on the use of existing clay, and will be less effective than C2, reducing infiltration to 2.2 inches per year. Therefore, C1 is the most cost-effective capping solution, by having the greatest impact on infiltration control for the least cost. The expected infiltration rates for the three capping alternatives are based on the HELP model, the results of which are shown in Table 16.

Gas Collection and Treatment:

The long-term costs of alternatives G1 and G2 are approximately $665,400 and $1.1 million dollars, respectively. G2 would cost more in capital expenditures. G3 would cost approximately $1.4 million, because of the increased cost of capital improvements, but would also be the easiest system to maintain and would be the most reliable system. Alternative G3, because of the increased reliability and effectiveness of a totally active system, and because the additional costs to install a totally active system are relatively minimal (compared with the benefit and reliability of the system), is the most cost-effective alternative.

Leachate Collection:

Alternative LC1, the lowest cost alternative, would cost approximately $49,700, the total of which is for long-term O&M. Alternative LC2 would cost approximately $1 million, of which approximately $230,000 is for capital expenditures and the balance is for long-term O&M for pumping and labor. LC3 and LC4 would cost $1.3 and $1.2 million, respectively. Although the highest capital cost is associated with LC4 ($439,000), the less intensive O&M requirements for pumping and upkeep of LC4 make it more attractive than LC3, from a cost perspective. Therefore, because LC4 provides the greatest benefit (a fully automated leachate collection system with minimal O&M required) for $1.2 million, and is only marginally more expensive than the LC2 alternative, LC4 is the most cost-effective alternative.

Leachate Treatment:

LT1 would cost the least (approximately $829,000), all of which is for O&M expenditures. Alternative LT2 would be the most expensive at $9.8 million. Approximately $476,000 would be required for the capital costs of the treatment system, and the majority of the LT2 cost ($9,300,000) is associated with O&M for the on-site treatment system. LT3 would be the second most expensive at $9,400,000. Approximately up to $1,840,000 would be required to build a treatment and discharge system for LT3 so that the treated leachate could be discharged using an NPDES permit. Given the excessive costs associated with construction and operation of an on-site treatment system and the relative ease of directly discharging to a POTW, alternative LT1, which is equally protective of the environment, and the most readily implementable of the three alternatives, is also the most cost-effective.

Groundwater Monitoring:

Alternative GW1 will cost approximately $1,500,000, and alternative GW2 will cost approximately $1,600,000. These costs represent the total present worth costs of implementing these groundwater monitoring programs for 30 years. The costs include capital costs of approximately $39,400 to abandon Public Well VW4 and approximately $652,800 to install a replacement municipal well, VW7. The installation of VW7 is complete. Since GW2 includes the additional features of a pre-design investigation and natural attenuation monitoring, and since GW2 is only marginally more expensive than GW1, GW2 is considered more cost-effective.

8. State Acceptance:

The IEPA has verbally concurred with the selected remedy of alternatives C1, G3, LC4, LT1, and GW2. The USEPA will include the State letter of concurrence in the Administrative Record upon receipt of the letter.

9. Community Acceptance

Comments from the public and PRPs are covered in the Responsiveness Summary (Appendix A) of this ROD. Oral and written comments from the community received during the public comment period were varied, with many comments covering the safety of drinking water from the groundwater aquifer, and the effectiveness of the preferred alternative of the Proposed Plan to ensure this safety.

The main issues covered by the WMII (a PRP) comments included WMII's contention that the vinyl chloride risk quantified in the BLRA is overstated, that the vinyl chloride contamination is probably not Site-related, and that a discount factor of less than seven percent should be used for cost estimating. The USEPA responded that it used proper procedures to develop the BLRA and to recommend use of the seven percent discount factor. The USEPA also responded that it has not been conclusively shown that the vinyl chloride contamination is not Site-related.

The main issues covered by the Village of Antioch (a PRP) include its concurrence with the preferred alternative of the Proposed Plan, its emphasis that the leachate and gas collection system must be active and must be implemented in conjunction with the cap improvements, its challenging of parts of the RI/FS, its challenging of WMII claims of current and past leachate extraction rates, and its request to review remedial inspection and monitoring reports.

The USEPA responded to the Village of Antioch that the USEPA does not plan to approve a less than fully active leachate and gas collection system unless the pilot studies conclusively show that such a lesser system will be fully protective of human health and the environment. The components of the selected remedy will be implemented together; they are not each stand-alone remedies. The USEPA acknowledged the Village's difference of opinion regarding some of the information presented in the RI/FS. Finally, USEPA noted that submission of inspection reports to the Village of Antioch may be negotiated between the Village of Antioch and any PRP or PRPs agreeing to perform the Remedial Design and Remedial Action (RD/RA), if the Village does not become a party to such an agreement.

IX. The Selected Remedy

The Site will be remediated according to USEPA's "Presumptive Remedy for CERCLA Municipal Landfill Sites" guidance of September, 1993. This guidance establishes containment as the presumptive remedy for CERCLA municipal landfills. The guidance states that containment technologies generally are appropriate for municipal landfill waste because the volume and heterogeneity of the waste generally make treatment impracticable. The guidance also states that collection and/or treatment of landfill gas, and measures to control landfill leachate may be implemented as part of the presumptive remedy.

The USEPA selects the following set of alternatives for the remediation of the Site, consistent with USEPA Presumptive Remedy guidance: C1 (landfill cap restoration and maintenance) for capping, G3 (active Site upgrade of the landfill gas system) for gas collection and treatment, LC4 (active leachate extraction) for leachate collection, LT1 (continue to discharge leachate to a POTW) for leachate treatment, and GW2 (monitored natural attenuation) for contaminated groundwater.

The selected remedy alternatives are integrated in that all of the selected remedy alternatives must be implemented to ensure that there is adequate protection to human health and the environment. In particular, the C1 selected alternative must be implemented along with the G3/LC4 gas collection and treatment/leachate collection upgraded system. Without such an upgraded system, the C1 selected alternative is not sufficient to protect human health and the environment.

Should problems arise at the FRWRD POTW due to the increased volumes of leachate to be processed, an alternate POTW, or an on-site or off-site treatment alternative will be considered. The selected remedy for leachate treatment allows for the flexibility of the leachate to be transported to a POTW other than FRWRD, as long as leachate permitting requirements are met.

See Section VII of this report for a description of each of the selected components of the remedy. See Figure 6 for a layout of the G3/LC4 dual gas/leachate extraction system, and see Figure 7 for a layout of the monitoring locations for selected component GW2. Locations and/or quantities of collection and/or monitoring points may vary slightly in the RD.

Tables 17, 18, 19, 20, and 21 provide breakdowns of the cost estimates for each component of the selected remedy (C1, G3, LC4, LT1, and GW2, respectively). O&M costs were estimated for a 30-year period. A discount rate of seven percent (before taxes and after inflation) was used to convert annual costs to present worth values. The seven percent discount rate is consistent with the latest USEPA guidance. The cost estimates are intended to represent a range in accuracy of -30% to +50% of the overall implementation costs of the selected remedy, which is also consistent with USEPA guidance.

Table 15 shows a cost estimate summary for all alternatives. Based on this information, the net present worth of the selected remedy is $7,229,600 ($2,270,000 for C1 + $1,358,400 for G3 + $1,183,600 for LC4 + $829,000 for LT1 + $1,588,600 for GW2 = $7,229,600).

The selected remedy also includes the following features: 1) a pre-design investigation to further study the extent, if any, of a groundwater contaminant plume, and 2) a contingent, active, groundwater remediation alternative. Should significantly more groundwater contamination be found during the pre-design investigation, should the VOCs in the groundwater be found to be migrating, or should the remedial actions taken not cause a decrease over time in the groundwater contaminant levels, then an active, groundwater remediation alternative will be considered as part of the remedial action for the Site.

For the GW2 groundwater monitoring component of the selected remedy, groundwater monitoring will be performed in order to comply with the chemical and action-specific ARARs of Table 13. The list of contaminants to be monitored, shown in Table 22, will be studied further during the RD.

For the G3 gas collection and treatment component of the selected remedy, air monitoring will be performed in order to comply with the action-specific ARARs for landfill gas management, gas collection, and landfill gas processing and disposal identified in Table 13. Frequencies of monitoring, monitoring points, contaminants and indicators monitored, and the duration of monitoring will be covered during the RD.

Surface water monitoring of Sequoit Creek will be performed to comply with the chemical-specific, surface water ARAR (35 IAC 302.202-302.212) shown in Table 11. Frequencies of monitoring, monitoring points, contaminants and indicators monitored, and the duration of monitoring will be covered during the RD.

A. Institutional Controls

The selected remedy includes institutional controls and Site access restrictions. Access restrictions will include upgrading the existing fencing, signs, gates, and deed restrictions. Upgrading the existing fencing will improve Site security and restrict access to the Site by unauthorized individuals. A newly constructed chain-link fence will be approximately six-feet high with three strands of barbed wire at the top. Approximately 2,000 lineal feet of fencing will be needed to either replace or augment the existing fencing and completely enclose the Site. Locking gates will be located at entry points. Warning signs that include a phone number to call for further information will be posted approximately every 300 feet along the fence, at a height of approximately five feet. The Site owners are responsible for implementing and maintaining the effectiveness of these access controls.

Restrictive covenants on deeds to the Site will be maintained to prevent or limit Site use and development. The covenants will notify a potential purchaser of the property of the past landfill activities, and will assert that the land use must be restricted to ensure the continued integrity of the waste containment remedy. The Site owners will ensure that these restrictive covenants are maintained.

Use of groundwater from the Site vicinity is prohibited by the Village of Antioch ordinance (Antioch Water Works and Sewage Ordinance Sections 50.008, 52.009, and 52.011) requiring properties within the Village limits that abut the public water works and sewerage system to connect to the municipal water supply system. Furthermore, the ordinance prohibits the installation of private wells within Village limits. The Village of Antioch is responsible for implementing these groundwater use restrictions.

B. Natural Attenuation

The natural attenuation remedy is described in the 1990 Preamble to the NCP at 55 Federal Register 8734 as a process that will effectively reduce contaminants in groundwater to concentrations which are protective of human health and sensitive ecological environments within a reasonable time frame. The natural attenuation remedy is not a no-action alternative. Rather, contaminant reduction is accomplished by any or all of the following mechanisms: dilution, adsorption, dispersion, and biodegradation. The circumstances under which the natural attenuation remedy should be considered include those situations where active restoration is not practicable, cost-effective, or warranted because of site-specific conditions, and those situations where physical and chemical attenuation mechanisms will effectively reduce contaminants in groundwater to concentrations protective of human health in a timeframe that is comparable to that which could be achieved through active restoration.

Recent guidance disseminated by USEPA (OSWER Directive No. 9200.4-17) clarified the circumstances under which a natural attenuation remedy should be used. These circumstances include the following:

- there is no demand for the resource while the natural attenuation remedy is in progress;
- long-term exposure controls are in effect to prevent exposure to contaminated groundwater and ensure protectiveness;
- the potential for further contaminant migration is low; and
- the natural attenuation remedy is employed in combination with other remedial measures.

The Site meets each of the criteria stated above. Vinyl chloride degradation behavior and the degradation rate is dependent on a number of environmental factors including the availability of electron donors (such as natural or anthropogenic organic carbon) and the concentration of acceptors (such as dissolved oxygen, nitrate, iron(III), and sulfate) in groundwater. Natural carbon can be expected to be plentiful in the wetland areas. Vinyl chloride degrades in a reducing environment such as the Site. The most recent data developed for the Site appears to indicate that the natural attenuation process has been reducing the concentrations of vinyl chloride downgradient of the landfill.

Currently, there is no demand for the groundwater either on-site, or off-site in the vicinity of the vinyl chloride contamination. Furthermore, institutional controls, current regulations, and practical land-use considerations will effectively prevent exposure to the contaminated groundwater. The hydrogeological and contaminant distribution data developed demonstrate that the vinyl chloride contaminant area is not migrating, and the concentrations are decreasing. The VOC groundwater contaminant levels, particularly for vinyl chloride, are expected to attenuate further as a result of implementing the waste cap improvements, and leachate and gas collection upgrades. Well US3D, which showed the highest levels of vinyl chloride contamination in 1994, already shows lower levels. In 1994, the level was 35 ppb, whereas the level in 1998 is approximately 15 ppb.

On the basis of the above evaluation, this Site meets each of the USEPA's criteria for implementation of a natural attenuation remedy.

C. Groundwater Cleanup Levels

Table 22 lists the groundwater cleanup levels for the Site. The list of contaminants and standards is taken from 35 IAC 620.410, which is the applicable State ARAR for groundwater cleanup levels. The deep sand and gravel aquifer under and adjacent to the Site showed vinyl chloride levels above the Federal MCL of 2 ppb, which is also the Illinois Groundwater Quality Standard for Class I (drinking water) aquifers. The USEPA considers the subject deep sand and gravel aquifer a Class I aquifer, based on the current use and expected future use for drinking water.

The point of compliance for the groundwater cleanup levels is at and beyond the waste management unit boundary. The approximate waste management unit boundary is shown in Figure 2. In particular, well US3D is the primary point of compliance since vinyl chloride contamination was detected in excess of the MCL at only this location. Well US3D is directly adjacent to and southwest of the waste management unit boundary, as shown in Figure 4. Figure 7 shows the groundwater monitoring locations that are part of the GW2 selected remedy component. Final locations to be used to monitor groundwater quality will be determined during the RD.

Since the effectiveness of the selected remedy components of waste cap improvements and leachate and gas collection upgrades on the remediation of the landfill (in terms of the rates of reducing the waste mass and reducing migration of VOCs into the groundwater) will not be known until the remedy is in operation, it is difficult to estimate the time period required to reach groundwater cleanup levels. It is also difficult to estimate this time period because of the uncertainties of the biological activity in the deep sand and gravel aquifer, the velocity of the groundwater flow, and the diffusion of VOCs in the subsurface environment.

Since vinyl chloride was the only contaminant identified in the BLRA as being associated with a significant health risk, the estimated range of time needed to fall below the vinyl chloride MCL of 2 ppb is presented:

> Assuming that the remedy eliminates further migration of vinyl chloride into the groundwater, the concentration in well US3D is expected to drop below 2 ppb (from current levels of approximately 15 ppb) in about 3.5 years. This is a best-case estimate, and takes into account the groundwater flow velocity in the deep sand and gravel aquifer, and the diffusing effect of the non-contaminated groundwater. The expected reduction in contaminant levels over time is supported by recent groundwater analytical results that show vinyl chloride concentrations are decreasing over time (from 35 ppb in 1994 to approximately 15 ppb in 1998).
>
> A worst-case estimate for the time of degradation assumes no groundwater flow. This estimate discounts microbial biodegradation and dilution in the flowing groundwater, and only accounts for natural diffusion of vinyl chloride over time. Given these conservative assumptions, the current, approximate concentration of 15 ppb vinyl chloride in well US3D may be expected to decrease below the MCL of 2 ppb in approximately 11 years.

X. Statutory Determinations

CERCLA Section 121(b)(1) (Cleanup Standards) states: "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants is a principle element, are to be preferred over remedial actions not involving such treatment. The off-site transport and disposal of hazardous substances or contaminant materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available." Section 121 of CERCLA also requires that the selected remedy be protective of human health and the environment, comply with ARARs unless a statutory waiver is justified, be cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The following sections discuss how the selected remedy meets these statutory requirements.

A. Protection of Human Health and the Environment

The C1 cap restoration and maintenance alternative will protect human health and the environment by preventing dermal contact with landfill contents, by reducing contaminant leaching to groundwater, by controlling surface water runoff and erosion, and by reducing the potential for direct inhalation of landfill gas by providing increased containment for landfill gas.

Any short term risks associated with regrading and placement of soil (dust generation and contaminant vaporization) will be minimized by the use of good construction practices. Air monitoring will be conducted during remedial action to assure compliance with all ARARs and other specified air quality standards.

The G3 active gas collection and treatment alternative sufficiently reduces risk to human health and the environment by preventing inhalation of vapors and by controlling migration of landfill gas. This alternative will further reduce the concentrations of VOCs in the leachate by removing them before they partition into the liquid phase.

The LC4 active leachate extraction alternative will extract leachate from the entire waste mass. This system will increase leachate collection volumes and control leachate head levels, thereby reducing the potential for leachate migration and minimizing potentially adverse impacts due to infiltration through the cap.

The LT1 leachate treatment alternative is currently operational at the Site. Under alternative LC4, larger volumes of leachate would be transported to the POTW during the beginning years of the remedial action. However, the LT1 alternative is protective of human health and the environment, provided the leachate is discharged to the POTW in accordance with the industrial discharge permit.

The GW2 monitored, natural attenuation alternative provides 30 years of ground water monitoring. Because migration of groundwater contamination and contaminant levels will be closely monitored over time, this alternative is protective of human health and the environment.

B. Attainment of ARARs

The selected remedy will comply with all Federal and State ARARs. The ARARs are identified in Tables 11, 12, and 13 of this ROD. The requirements which significantly impact the remedy are summarized here.

The primary chemical-specific ARAR is the IEPA Groundwater Quality Standards for Class I (drinking water) groundwater. This requirement states that concentrations of the listed inorganic and organic chemical constituents must not be exceeded in Class I groundwater, except due to natural causes or as provided in 35 IAC 620.450 (Alternative Groundwater Quality Standards).

The primary location-specific ARAR for the selected remedy relates to the protection of wetlands at the Site, as the Site is not located in a floodplain. Compliance will be assured by minimizing physical disturbance of the seasonal wetlands during cap improvement activities. Since the seasonal wetlands are located south of the "new landfill" area, outside the delineated landfill boundaries, there should be no physical disturbance of the wetlands during the remedial action.

The primary action-specific ARARs are IEPA cover requirements at 35 IAC 807; IEPA post-closure care (including leachate collection) requirements at 35 IAC 811; IEPA leachate treatment, storage, and disposal requirements at 35 IAC 811; and landfill gas management, collection, processing, and disposal requirements (described in various parts of 35 IAC). Compliance with leachate treatment and disposal requirements will be achieved by trucking the leachate to a permitted POTW and properly treating the leachate at the POTW.

C. Cost-Effectiveness

The present worth of the selected remedy (based on 30 years of O&M and a seven percent discount rate) is $7,229,600. This total cost is made up of the C1 component cost of $2,270,000, the G3 component cost of $1,358,400, the LC4 component cost of $1,183,600, the LT1 component cost of $829,000, and the GW2 cost of $1,588,600. See Table 15.

The selected remedy provides overall cost-effectiveness because it uses on-site and off-site remedial measures to obtain a high level of prot ctiveness, compared to the cost of implementation.

The selected remedy includes the least costly capping and leachate treatment alternatives. The gas and leachate collection portions of the selected remedy are more costly because of the need to effectively reduce the waste mass, thereby minimizing the chances for groundwater contaminant migration. The groundwater monitoring portion of the selected remedy is slightly more costly than the NFA groundwater alternative, because of additional monitoring requirements and because of the requirement for a pre-design investigation to further study the extent, if any, of a groundwater contaminant plume.

D. Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The C1 alternative will control stormwater infiltration into the landfill, thereby decreasing the potential for contaminant transport into the leachate and groundwater. This alternative, which combines both access restrictions and improved cover, will prevent direct contact with landfill contents. It will also minimize future erosion and control surface water runoff by implementing the maintenance plan described for the alternative. The soil cover can last indefinitely if correctly maintained.

The G3 alternative will provide increased long-term effectiveness and permanence over the other gas collection and treatment alternatives. It will provide active extraction of landfill gas, thereby reducing the VOCs in the waste mass. This alternative will also be very effective at minimizing landfill gas emissions from the Site.

The LC4 alternative will increase leachate collection quantities compared to the current system, and should operate effectively for many years. The increased leachate extraction will reduce leachate levels in the landfill and control the formation of leachate seeps. The reduction of leachate volume within the waste mass will minimize the potential for migration of leachate to groundwater.

The LT1 alternative will provide long-term, effective leachate treatment. However, this is contingent on the POTW being able to process the increased volume of leachate delivered from the Site.

The GW2 alternative has long-term effectiveness in that it will provide for 30 years of groundwater monitoring and analysis.

Since transport of the leachate to a POTW and POTW leachate treatment is already an efficient method of leachate treatment that is protective of human health and the environment, alternative treatment technologies are not appropriate for inclusion to the selected remedy.

Containment is an appropriate remedy for the municipal landfill waste because the volume and heterogeneity of the waste generally make direct treatment of the waste impractical and cost-ineffective. Instead of direct treatment of the waste, the selected remedy uses leachate collection and treatment, gas collection and treatment, and waste cap improvements, which are much more cost-effective measures that provide protection of human health and the environment.

E. Preference for Treatment as a Principal Element

The selected remedy reduces the threat of ingesting vinyl chloride-contaminated groundwater by employing waste cap improvements, landfill gas collection and treatment, and leachate collection and treatment. Since the selected remedy includes leachate and landfill gas treatment, the selected remedy satisfies the statutory preference to employ treatment as a principal element to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants.

XI. Documentation of Significant Changes

There are no significant changes in the selected remedy from the preferred alternative originally presented in the Proposed Plan.

SITE LOCATION MAP

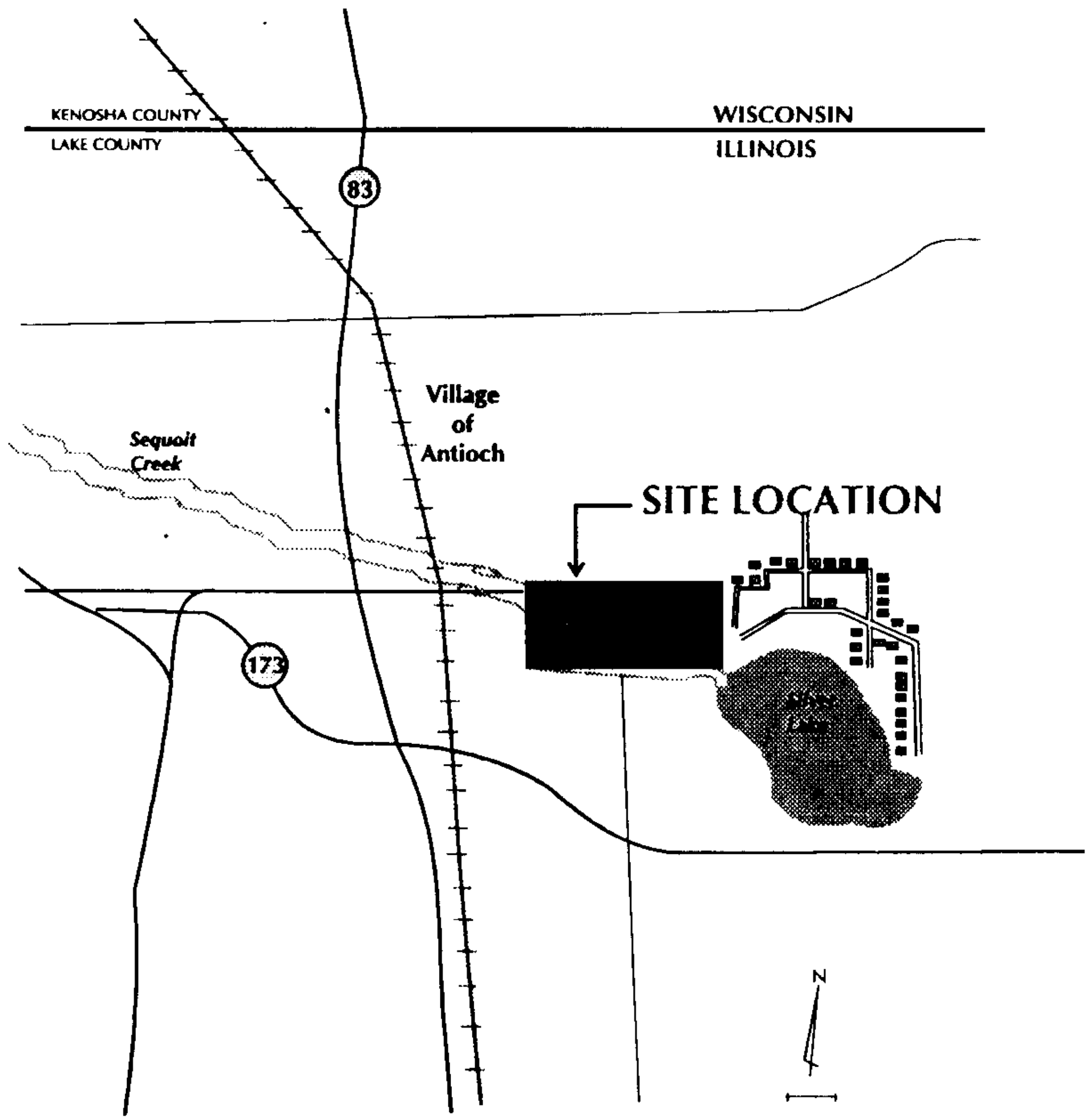
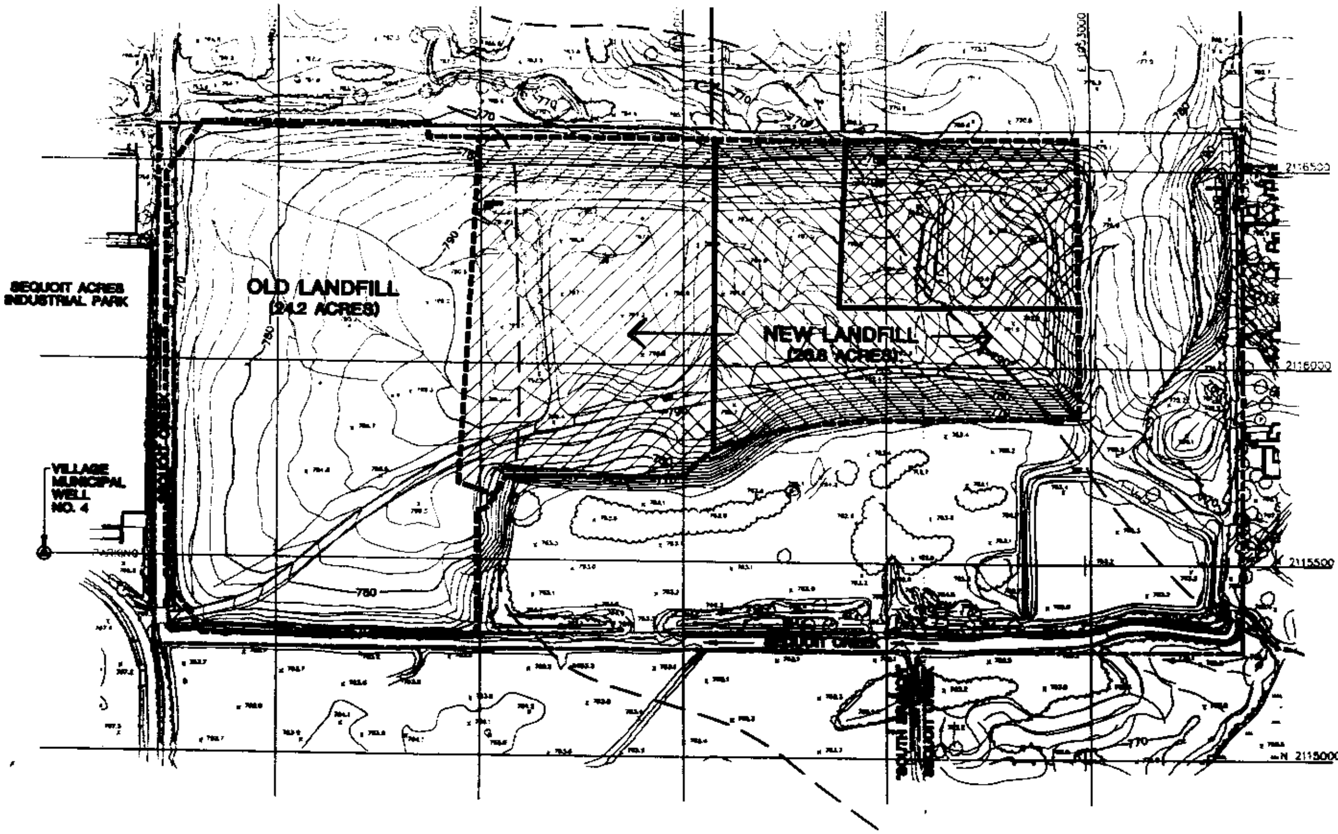


FIGURE 1



LEGEND

- APPROXIMATE PROPERTY LINE
- APPROXIMATE LIMITS OF LANDFILLED AREA
- 780 TOPOGRAPHIC CONTOUR LINE
- TREES, BRUSH
- ACCESS ROAD
- BUILDING
- SPOT ELEVATION
- FENCE LINE
- APPROXIMATE LIMIT OF SEQUOIT CREEK MARCH PRIOR TO CHANNELIZATION
- APPROXIMATE LOCATION OF AREA OPERATED USING "TRENCH FILL" METHOD
- APPROXIMATE LOCATION OF AREA OPERATED USING "AREA FILL" METHOD
- APPROXIMATE LOCATION OF PORTION OPERATED AS "DEEP TRENCH" AREA

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1993.
2. TOPOGRAPHY IS BASED IN U.S.G.S. DATUM.
3. GRID BASED ON ILLINOIS STATE PLANE COORDINATE SYSTEM.

north

0 300 600

SCALE IN FEET

FIGURE 2

QUALITY CONTROL | Graphic Standards CCM 4-8-97 | Lead Professional | Technical Review | Project Manager | Management Review | Other

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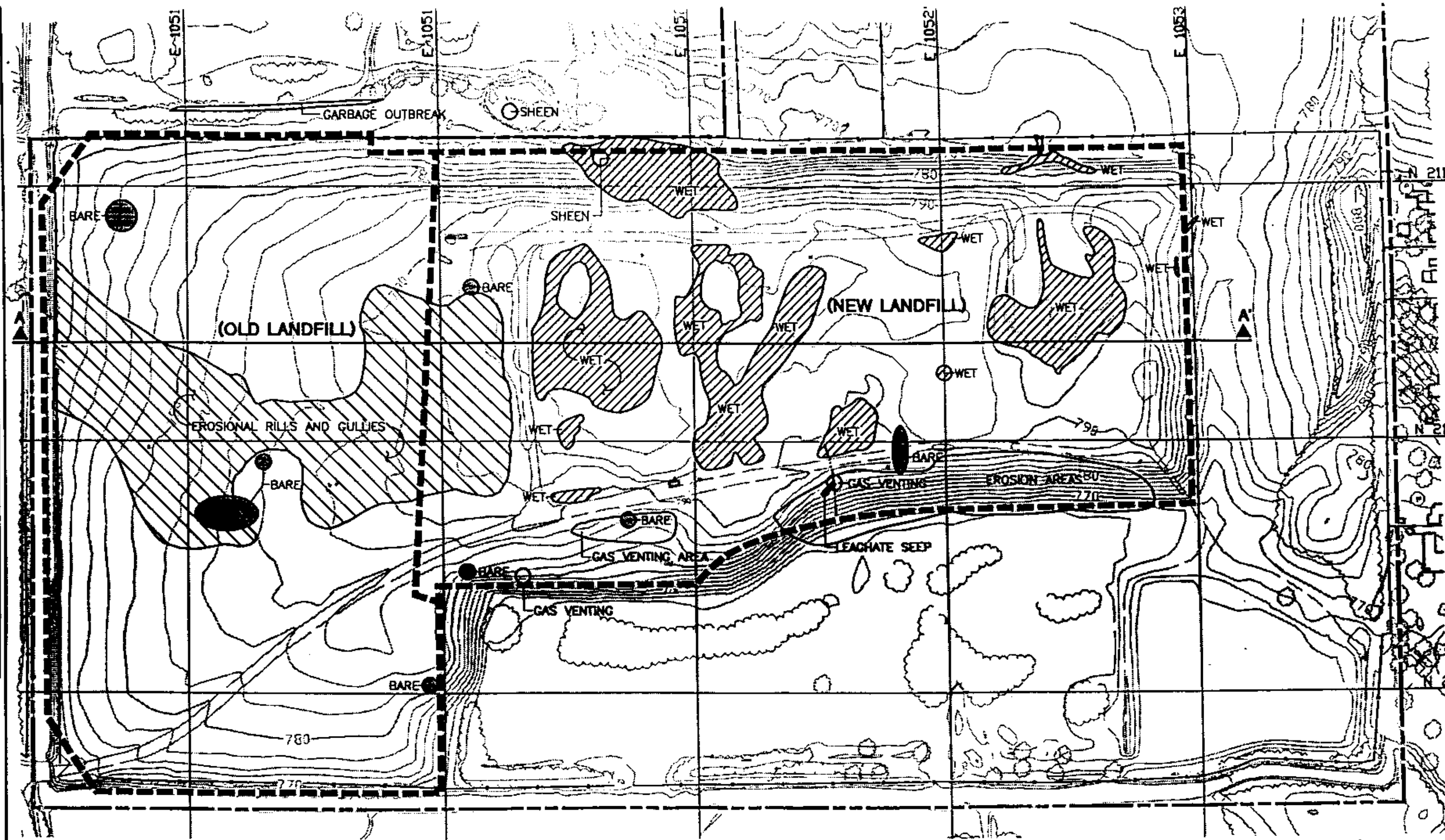
Developed By SJC | Drawn By CCM | Approved By | Date | Reference | Revisions

SITE FEATURES MAP

H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Drawing Number 1252035 03090210 B1

MONTGOMERY WATSON



LEGEND

APPROXIMATE PROPERTY LINE

APPROXIMATE LIMITS OF LANDFILLED AREA

780 TOPOGRAPHIC CONTOUR LINE

TREES, BRUSH

ACCESS ROAD

BUILDING

FENCE LINE

DOCUMENTED AREAS

A A' CROSS SECTION LOCATION

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1993.
2. LANDFILL COVER SURVEY DOCUMENTED BY WARZYN INC. ON MARCH 23 AND 24, 1994.

north

0 200 400

SCALE IN FEET

FIGURE 3

EXISTING CONDITIONS - LANDFILL COVER

H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Developed By LAB | Drawn By LCL
Approved By | Date
Reference 2386.0096-B4
Revisions

Drawing Number 1252035 03090210 B

MONTGOMERY WATSON

QUALITY CONTROL | Graphic Standards DLF 3-19-97 | Technical Review LAB 3-19-97 | Management Review
Lead Professional | Project Manager | Other

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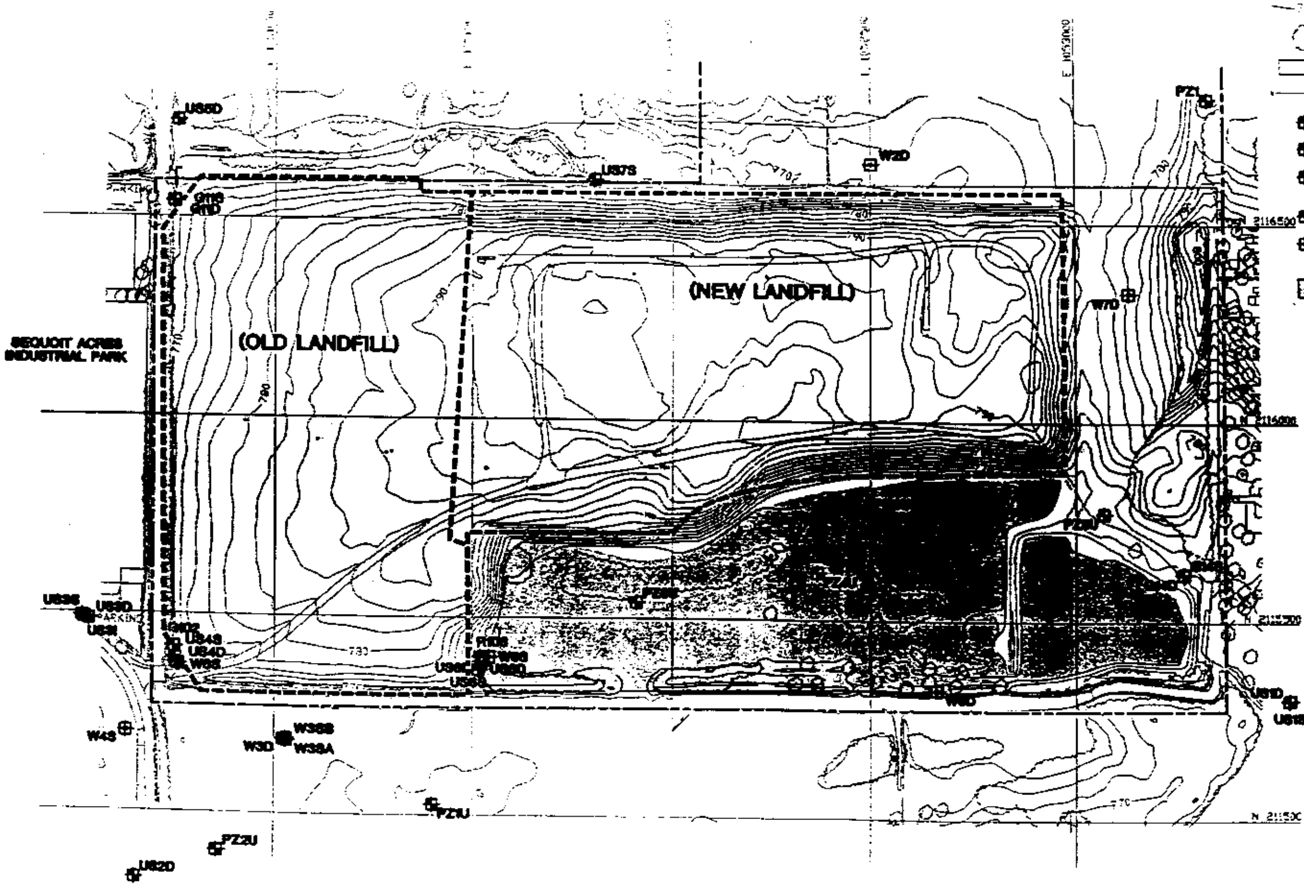


LEGEND

- APPROXIMATE PROPERTY LINE
- APPROXIMATE LIMITS OF LANDFILLED AREA
- TOPOGRAPHIC CONTOUR LINE
- TREES, BRUSH
- BUILDING
- FENCE LINE
- R103 TSC MONITORING WELL LOCATION AND NUMBER
- PZ1U PELA PIEZOMETER LOCATION AND NUMBER
- US4S USEPA MONITORING WELL LOCATION AND NUMBER
- G116 TSC MONITORING WELL LOCATION AND NUMBER
- W7D WARZYN MONITORING WELL LOCATION AND NUMBER
- APPROXIMATE AREA OF SEASONAL WETLAND (NOTE 4.)

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1983.
2. LOCATION OF PELA STAFF GAGES PSG1 AND PSG2 ARE APPROXIMATE.
3. INVESTIGATION POINTS HAVE BEEN LOCATED BASED ON GENTILE AND ASSOCIATES, INC. SURVEY PERFORMED ON DURING JUNE AND JULY 1993.
4. WETLAND AREA SHOWN HERE IS CONSISTENT WITH INFORMATION PRESENTED IN PELA H.O.D. LANDFILL WETLANDS ASSESSMENT, JULY 1993 AND JJR, INC. WETLAND MITIGATION BANKING STUDY, JULY 1997.

north

0 300 600

SCALE IN FEET

FIGURE 4

MONITORING WELL AND PIEZOMETER LOCATION MAP

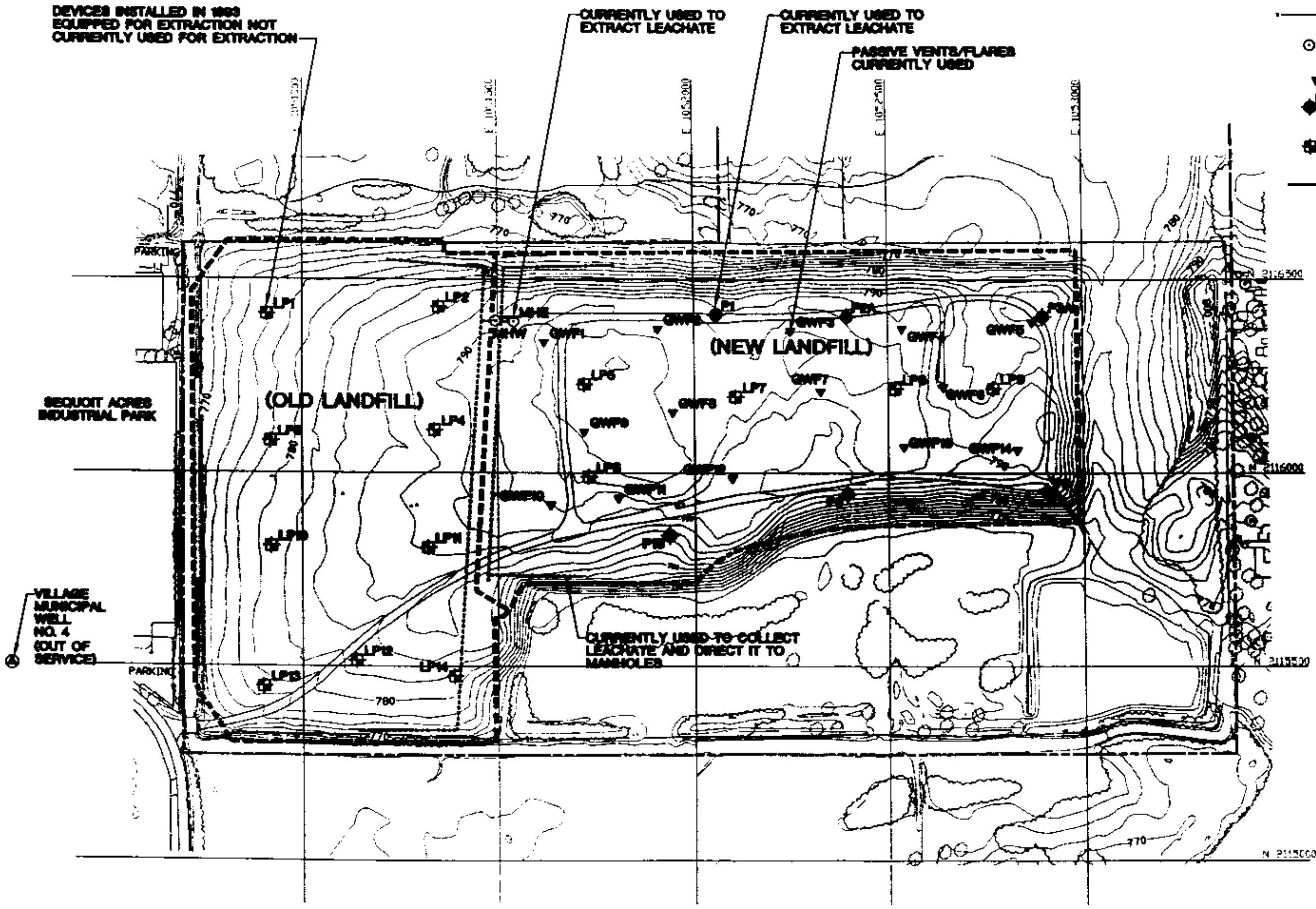
H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Developed By SJC
Drawn By CCM
Approved By
Date
Reference
Revisions

Drawing Number
1252035
03090210
B2

MONTGOMERY WATSON

QUALITY CONTROL
Graphic Standards
Lead Professional
Technical Review
Project Manager
Management Review
Other



LEGEND

- APPROXIMATE PROPERTY LINE
- APPROXIMATE LIMITS OF LANDFILLED AREA
- 780 TOPOGRAPHIC CONTOUR LINE
- TREES, BRUSH
- BUILDING
- FENCE LINE
- MHW/MHE LEACHATE COLLECTION MANHOLE WEST/ LEACHATE COLLECTION MANHOLE EAST
- GWF1 GAS FLARE LOCATION AND NUMBER
- P2A LEACHATE EXTRACTION WELL LOCATION AND NUMBER
- LP8 WARZYN LEACHATE PIEZOMETER LOCATION AND NUMBER
- LEACHATE COLLECTION PIPE (LOCATION APPROXIMATE)

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1993.
2. INVESTIGATION POINTS HAVE BEEN LOCATED BASED ON GENTILE AND ASSOCIATES, INC. SURVEY PERFORMED ON DURING JUNE AND JULY 1993.

north

0 300 600

SCALE IN FEET

FIGURE 5

QUALITY CONTROL	Graphic Standards DLF 3-19-97	Technical Review LAB 3-19-97	Management Review
	Lead Professional	Project Manager	Other

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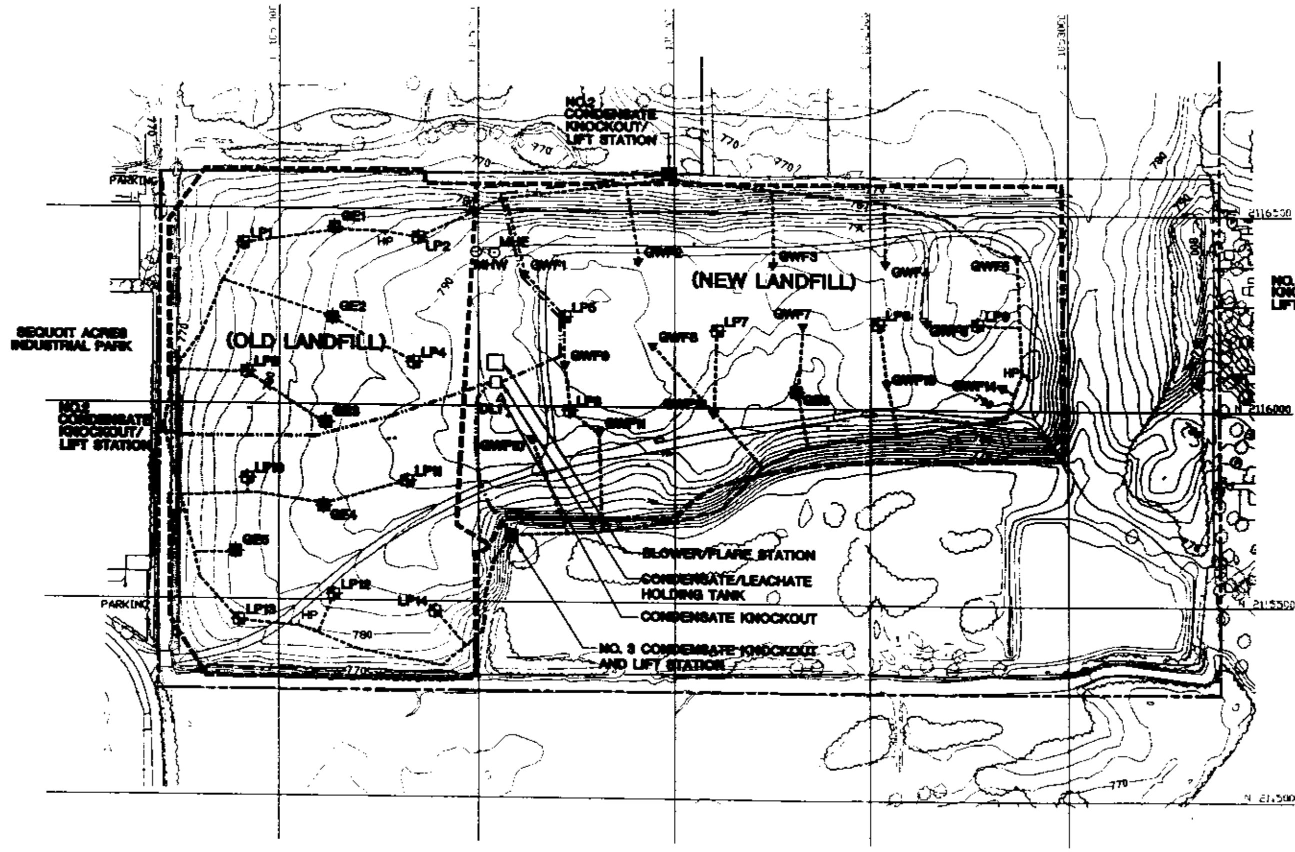
Developed By LAB | Drawn By LCL
Approved By | Date
Reference J:/1252/035/03090210/MWDWGS/B10.dwg
Revisions

EXISTING GAS AND LEACHATE EXTRACTION DEVICES

H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Drawing Number
1252035
03090210 B10

MONTGOMERY WATSON



NOTE
THIS PIPING CONFIGURATION IS THE SAME FOR ALTERNATIVES G3 AND LC4.

LEGEND (EXISTING)

- APPROXIMATE PROPERTY LINE
- APPROXIMATE LIMITS OF LANDFILLED AREA
- 780 TOPOGRAPHIC CONTOUR LINE
- TREES, BRUSH
- BUILDING
- FENCE LINE
- MHW/MHE LEACHATE COLLECTION MANHOLE WEST/ LEACHATE COLLECTION MANHOLE EAST
- GWF1 GAS FLARE LOCATION AND NUMBER
- LP8 LEACHATE PIEZOMETER LOCATION AND NUMBER

LEGEND (PROPOSED)

- GE1 GAS EXTRACTION WELL LOCATION AND NUMBER
- DL1 DRIPLEG LOCATION AND NUMBER
- GAS HEADER PIPE (AND LEACHATE HEADER, IF DUAL SYSTEM)
- CONDENSATE/LEACHATE CONVEYANCE PIPE
- CONDENSATE KNOCKOUT/LIFT STATION LOCATION AND NUMBER
- HP PIPING HIGH-POINT LOCATION

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1993.
2. INVESTIGATION POINTS HAVE BEEN LOCATED BASED ON GENTILE AND ASSOCIATES, INC. SURVEY PERFORMED ON DURING JUNE AND JULY 1993.

ALTERNATIVE G3 PROPOSES

1. USE OF EXISTING EXTRACTION DEVICES GWF1-GWF14, LP1-LP14.
2. CONSTRUCTION OF NEW WELLS GE1-GE6.
3. CONSTRUCTION OF HEADER PIPING, CONDENSATE DRIPLEGS, BLOWER AND FLARE.

ALTERNATIVE LC4 PROPOSES

IN ADDITION TO ITEMS 1-3 OF ALTERNATIVE G3, LEACHATE HEADER PIPING WILL BE ADDED TO PIPE TRENCHES.

north

0 300 600

SCALE IN FEET

FIGURE 6

Developed By TST	Drawn By DKP
Approved By TAB	Date 2/5/98
Reference J:/1252/035/03090210/MWOKGS/B12.dwg	
Revisions	

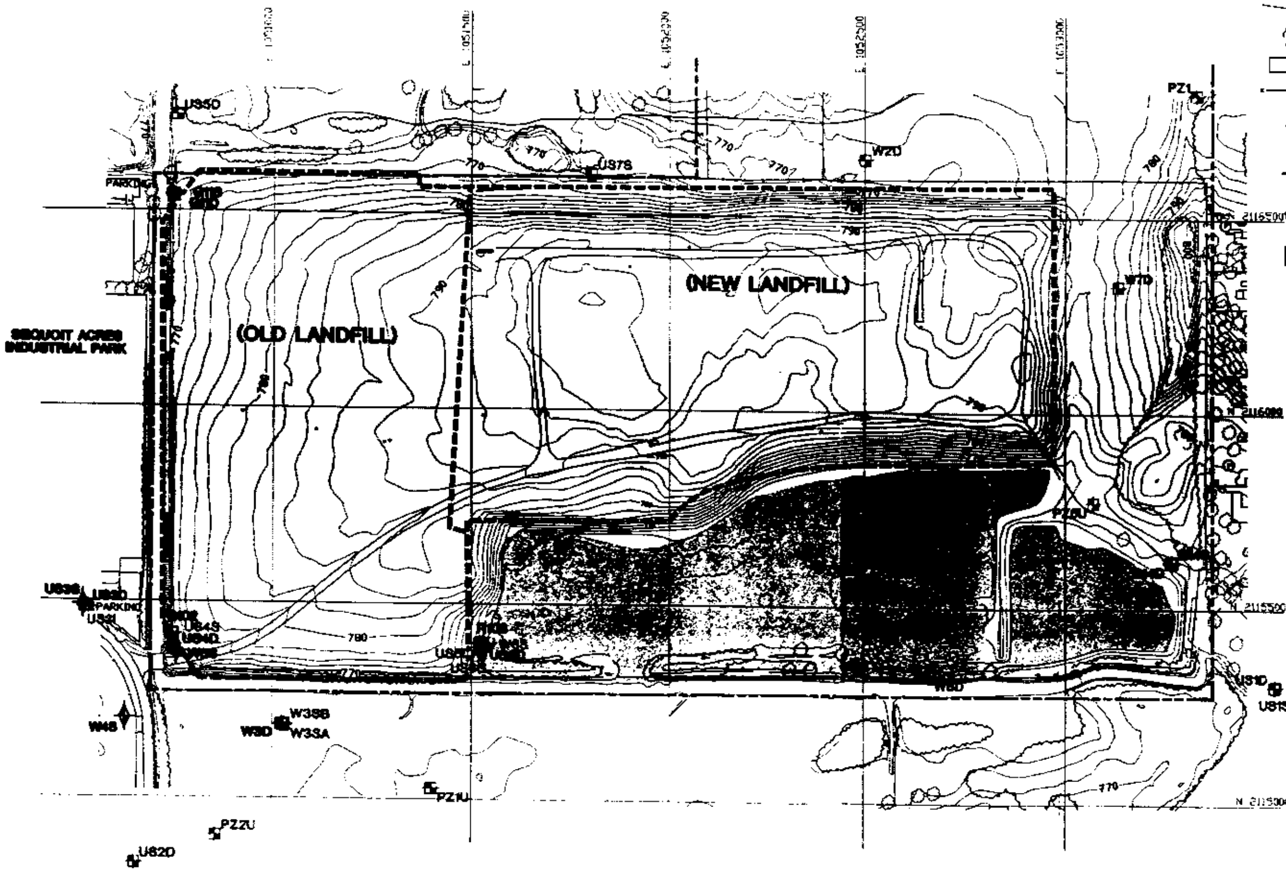
ALTERNATIVE G3-ACTIVATION OF LFG SYSTEM
ALTERNATIVE LC4-ACTIVE LEACHATE EXTRACTION

H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Drawing Number
1252035
03090210 B12

MONTGOMERY WATSON

QUALITY CONTROL		
Graphic Standards DLF	3-19-97	Technical Review LAB 3-19-97	Management Review
Lead Professional DRF	3-17-97	Project Manager	Other



LEGEND

- APPROXIMATE PROPERTY LINE
- APPROXIMATE LIMITS OF LANDFILLED AREA
- 780 TOPOGRAPHIC CONTOUR LINE
- TREES, BRUSH
- BUILDING
- FENCE LINE
- R10S PROPOSED SAMPLE LOCATION (IN CURRENT MONITORING PLAN)
- US5D PROPOSED SAMPLE LOCATION (NOT IN CURRENT MONITORING PLAN)
- US5D PROPOSED DOWNGRADIENT MONITORING NETWORK (NOT IN CURRENT MONITORING PLAN)
- APPROXIMATE AREA OF SEASONAL WETLAND (NOTE 3.)

NOTES

1. BASE MAP DEVELOPED FROM AN AERO-METRIC ENGINEERING INC. SURVEY, DATED JULY 21, 1993.
2. INVESTIGATION POINTS HAVE BEEN LOCATED BASED ON GENTILE AND ASSOCIATES, INC. SURVEY PERFORMED ON DURING JUNE AND JULY 1993.
3. WETLAND AREA SHOWN HERE IS CONSISTENT WITH INFORMATION PRESENTED IN PELA H.O.D. LANDFILL WETLANDS ASSESSMENT, JULY 1993 AND JJR, INC. WETLAND MITIGATION BANKING STUDY, JULY 1997.

FIGURE 7

Developed By TST | Drawn By DKP
Approved By TAB | Date 2/5/98
Reference
Revisions

SAMPLE LOCATIONS GROUNDWATER MONITORING PLAN

H.O.D. LANDFILL
WASTE MANAGEMENT OF ILLINOIS, INC.
ANTIOCH, ILLINOIS

Drawing Number 1252035 03090210 B15

MONTGOMERY WATSON

QUALITY CONTROL: Graphic Standards / Land Professional / Technical Review / Project Manager / Management Review / Other

Table 1: List of Acronyms and Abbreviations, Page 1 of 2

ADR	Alternative Dispute Resolution
AOC	Administrative Order on Consent
ARAR	applicable or relevant and appropriate requirement
BLRA	Baseline Risk Assessment
BOD	biochemical oxygen demand
C1	Capping Alternative # 1
C2	Capping Alternative # 2
C3	Capping Alternative # 3
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
ESI	Expanded Site Investigation
FIT	Field Investigation Team
FRWRD	Fox River Water Reclamation District
FS	Feasibility Study
G1	Gas Collection and Treatment Alternative # 1
G2	Gas Collection and Treatment Alternative # 2
G3	Gas Collection and Treatment Alternative # 3
GMZ	groundwater management zone
gpd	gallons per day
gpm	gallons per minute
GW1	Groundwater Monitoring Alternative # 1
GW2	Groundwater Monitoring Alternative # 2
HELP	Hydrologic Evaluation of Landfill Performance
HRS	Hazard Ranking Score
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
LC1	Leachate Collection Alternative # 1
LC2	Leachate Collection Alternative # 2
LC3	Leachate Collection Alternative # 3
LC4	Leachate Collection Alternative # 4
LFG	landfill gas
LT1	Leachate Treatment and Disposal Alternative # 1
LT2	Leachate Treatment and Disposal Alternative # 2
LT3	Leachate Treatment and Disposal Alternative # 3
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MHE	east manhole
MHW	west manhole
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

Table 1: List of Acronyms and Abbreviations, Page 2 of 2

NPDES	National Pollutant Discharge Elimination System
NFA	no further action
NPL	National Priorities List
O&M	operation and maintenance
OSWER	USEPA Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PELA	P.E. Lamoreaux & Associates
PNA	polynuclear aromatic hydrocarbon
POTW	publicly owned treatment works
ppb	parts per billion
PRP	potentially responsible party
PSER/TS	Preliminary Site Evaluation Report/Technical Scope
PW	present worth value
RA	Remedial Action
RACT	Reasonably Available Control Technology
RD	Remedial Design
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
ROI	radius of influence
SARA	Superfund Amendments and Reauthorization Act of 1986
SVOC	semi-volatile organic contaminant
TCE	trichloroethylene
TSC	Testing Services Corporation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic contaminant
VW	village well
WMII	Waste Management of Illinois, Inc.

Table 2: Selection of Chemicals of Concern in Groundwater

Chemical	DATA GROUPING					
	ON-SITE		OFF-SITE		Private Wells (Silver Lake Area)	Municipal Wells
	Surficial Sand	Deep Sand/Gravel	Surficial Sand	Deep Sand/Gravel		
Aluminum	ND	ND	ND	ND	6	1
Arsenic	6	6	6	ND	ND	1
Barium	6	6	6	1	6	1
Beryllium	ND	ND	2	ND	ND	ND
Cadmium	ND	6	6	ND	ND	ND
Calcium	5	5/6	5	5	5/6	5
Chromium (total)	2	2	2	1	2	1
Cobalt	ND	ND	2	ND	4	ND
Copper	ND	ND	ND	ND	4	ND
Iron	5	5	5	5	5/6	5
Lead	ND	ND	ND	ND	6	ND
Magnesium	5	5/6	5/6	5	5/6	5
Manganese	2	2	2	1	6	1
Nickel	ND	ND	6	1	ND	ND
Potassium	5/6	5/6	5/6	5	5/6	5
Sodium	5/6	5/6	5/6	5	5	5
Thallium	ND	2	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	6	ND
Zinc	ND	ND	6	1	2	1
Carbon disulfide	3	ND	ND	ND	ND	3
4-Chloroaniline	ND	ND	ND	ND	ND	3
1,2-Dichloroethene	3	ND	3	3	ND	3
2-Methylphenol	ND	ND	ND	ND	3	3
Trichloroethene	3	ND	ND	ND	ND	ND
Vinyl chloride	3	ND	3	3	ND	ND
Acetone	ND	ND	ND	ND	ND	3
Chloroform	ND	ND	ND	ND	ND	3
1,2-Dichloroethane	ND	ND	ND	ND	ND	3

Shaded area indicates a contaminant of concern selected for this data grouping.
ND = Not detected in this data group.

Rationale for contaminant selection:

1 = Selected as a default because there were fewer than three samples in this data grouping, in accordance with telephone conference call with USEPA Region 5 on February 3, 1994.
2 = Selected because regional background data were not available for this contaminant.
3 = All organic contaminants were selected.
4 = Selected because a significant difference was observed in a t-test with regional background data (at p = 0.05 significance level).

Rationale for contaminant exclusion:

5 = Chemical not selected because it is an essential human nutrient.
6 = Chemical not selected because no significant difference was observed in a t-test with regional background groundwater data (at p = 0.05 significance level).

Table 3: Selection of Chemicals of Concern in On-site Surface Water, Sediment, and Soil

Chemical	On-site Soil	Sequoit Creek Surface Water	Sequoit Creek Sediment
Acenaphthene	3	ND	ND
Acetone	3	ND	ND
Anthracene	3	ND	ND
Benzene	3	ND	ND
Benzo(a)anthracene	ND	ND	3
Benzo(a)pyrene	ND	ND	3
Benzo(b)fluoranthene	3	ND	3
Carbazole	3	ND	ND
Carbon disulfide	3	ND	ND
Chrysene	ND	ND	3
4,4-DDD	3	ND	ND
Dibenzofuran	3	ND	ND
1,4-Dichlorobenzene	3	ND	ND
Ethylbenzene	3	ND	ND
Fluoranthene	3	ND	3
Fluorene	3	ND	ND
bis(2-Ethylhexyl)phthalate	3	ND	3
Methylene Chloride	3	ND	ND
2-Methylnaphthalene	3	ND	ND
Naphthalene	3	ND	ND
Phenanthrene	3	ND	3
Pyrene	3	ND	3
Toluene	3	ND	ND
Xylenes (total)	3	ND	ND
2-Hexanone	ND	3	ND
4-Methyl-2-pentanone	ND	3	ND
Antimony	ND	2	ND
Aluminum	2	6	6
Arsenic	6	ND	4
Barium	6	4	6
Beryllium	2	ND	6
Cadmium	2	ND	6
Calcium	5	5/6	5
Chromium (total)	2	ND	6
Cobalt	6	ND	6
Copper	6	6	6
Cyanide	ND	ND	6
Iron	5/6	5	5/6
Lead	6	2	6
Magnesium	5	5/6	5/6
Manganese	6	6	6
Mercury	ND	ND	6
Nickel	6	ND	6
Potassium	5/6	5/6	5/6
Sodium	5	5/6	5
Thallium	ND	ND	2
Vanadium	6	ND	6
Zinc	6	ND	6

Shaded area indicates a contaminant of concern selected for this data grouping
ND Not detected in this data group

Rationale for contaminant selection

1 Selected as a default because there were fewer than three samples in this data grouping, in accordance with telephone conference call with USEPA Region 5 on February 3, 1994
2 Selected because background data were not available for this contaminant.
3 All organic contaminants were selected
4 Selected because a significant difference was observed in a t-test with regional background data (at p = 0.05 significance level)

Rationale for contaminant exclusion

5 Chemical not selected because it is an essential human nutrient
6 Chemical not selected because no significant difference was observed in a t-test with background data (at p = 0.05 significance level), or significant difference was observed because background levels were significantly higher than Site levels.

Table 4
Summary of Analytical Results
Detected VOCs, SVOCs and Pesticides/PCBs
Remedial Investigation - Leachate Samples
H.O.D. Landfill
Antioch, Illinois

Compounds	Groundwater Standards			Sample Designation							
	MCL	Class I	Class II	HD-LCLP01-01	HD-LCLP01-91	HD-LCLP06-01	HD-LCLP08-01	HD-LCLP11-01	HD-LCMHE-01	HD-LCFB01-01	HD-LCTB02-01
Detected VOCs											
Detection Limit				25	50	250	1,000	500	10	10	10
Vinyl Chloride	2	2	10						18		
Chloroethane				45	46						
Methylene Chloride	5	5	50	160	180	58			44	1	3
Acetone		700	700	110		2,200	19,000	1,500	140	13	5
1,1-Dichloroethene	7	7	35						5		
1,1-Dichloroethane		700	3,500						13		
1,2-Dichloroethene	70	70	200	7				190	70		
1,2-Dichloroethane	5	5	25						22		
2-Butanone				190		3,200	12,000	3,900	120		
1,2-Dichloropropane	5	5	25						28		
Trichloroethene	5	5	25						14		
Benzene	5	5	25	12	13				22		
4-Methyl-2-Pentanone				22	22	160	450		43		
2-Hexanone				14							
Tetrachloroethene	5	5	25	9					9		
Toluene	1,000	1,000	2,500	330	450	210	260	740	62		
Ethylbenzene	700	700	1,000	52	46			130			
Xylenes (total)	10,000	10,000	10,000	100	90	170		330	41		
Detected SVOCs											
Detection Limit				50	54	10	52	10	10	10	
Phenol		100	100	160	170	83	840	5J	19		
1,4-Dichlorobenzene						5		20			
2-Methylphenol		350	350			16					
4-Methylphenol				730	760	1,300	2,200	48	5J		
2,4-Dimethylphenol		140	140	12J	11J	4J	20J	3J	6J		
Naphthalene		25	39		34J	6J	26J	16			
Diethylphthalate		5,600	5,600	32J	31J			4J			
Di-n-butylphthalate		700	3,500							1J	
bis(2-ethylhexyl)phthalate		6	60					42			
Detected Pesticides/PCBs											
Detection Limit				1	1	1	1	1	1.1	1.1	
Aroclor-1016		0.5	2.5	4.6	6.3						

Notes:
TICs not reported in Table; TICs results presented in Appendix O-7 of the RI
Concentrations reported in micrograms per liter (ug/L)
J - Estimated value below detection limit
Samples collected on May 12-13, 1993

Table 5
Summary of Detected VOCs
Remedial Investigation - Landfill Gas Samples
H.O.D. Landfill
Antioch, Illinois

Compounds	Sample Designation													
	HD-LGLP01-01	DL	D-LGLP06-0	DL	HD-LGLP07-01	DL	D-LGLP08-0	DL	D-LGLP11-0	DL	HD-LGLP11-91	DL	HD-LGTB01-01	DL
Freon 12		4	6,300	80	1,800	400	2,100	400	9,100	400	8,600	200		
Chloromethane		5		6,000		500	720	500		500		250		
Freon 114		4	7,200	80		400	760	400	860	400	940	200		
Vinyl Chloride		5	4,900	100	21,000	500	13,000	500	1,100	500	1,300	250		
Chloroethane	47	10	810	200		1,000		1,000		1,000		500		
Freon 11	78	2	12,000	200	270	200		200	310	200	330	100		
cis-1,2-DCE	6.3	4	370	80	5,400	400	1,400	400	2,400	400	2,700	200		
Carbon Disulfide		20	690	400		2,000		2,000		2,000		1,000		
Acetone		20	730	400	3,900	2,000	15,000	2,000		2,000	520	1,000		
Methylene Chloride	95	8	220	160		800		800		800		400		
1,1-Dichloroethane		5	140	100	540	500		500		500		250		
1,1-Dichloroethene		4		80	480	400		400		400		200		
2-Butanone	21	6	1,800	120	5,200	600	22,000	600		600	600	300		
Benzene	10	6	420	120	970	600	670	600	630	600	690	300		
Trichloroethene		5	160	100	2,500	500	590	500	960	500	1,000	250		
Toluene	540	6	11,000	120	66,000	600	53,000	600	20,000	600	21,000	300		
Tetrachloroethene		6	270	120	4,400	600	830	600	2,700	600	2,800	300		
Chlorobenzene		5	180	100		500	4,500	500		500		250		
Ethylbenzene	34	5	3,700	100	11,000	500	9,700	500	3,200	500	3,400	250		
Xylenes (total)	52	10	7,600	200	30,000	1,000	24,000	1,000	7,000	1,000	7,100	500		
4-Ethyl toluene		8	520	160	1,300	800	2,600	800		800	490	400		
1,3,5-Trimethylbenzene		5	200	100	510	500	910	500		500		250		
1,2,4-Trimethylbenzene		6	440	120	1,200	600	2,100	600		600	420	300		

Notes:
Samples collected on June 4,1993
Concentrations reported in parts per billion
Only detected compounds reported
No compounds detected in Trip Blank
DL = detection limit

Table 6, Page 1 of 2
Summary of Analytical Results
Detected VOCs, SVOCs and Pesticides/PCBs
Remedial Investigation - Round 1 and 2 Groundwater Samples
H.O.D. Landfill
Antioch, Illinois

Round I Groundwater Sampling					
Sample Designation	Compounds				
	Acetone	Carbon Disulfide	Vinyl Chloride	1,2-DCE	TCE
MCL			2	70	5
Class I Std.	700	700	2	70	5
Class II Std.	700	3500	10	200	25
G11S-01		0.8J			
G11D-01					
US01S-01					
US01D-01					
US03S-01					
US03I-01					
US03D-01			28	11	
US04S-01				35	
US04D-01					
US06S-01					
US06I-01					2J
US06D-01					
W3D-01					
W3SB-01					
W4S-01					
W5S-01			19		
W6S-01				2J	
W7D-01					

Round II Groundwater Sampling					
Sample Designation	Compound				
	Acetone	Carbon Disulfide	Vinyl Chloride	1,2-DCE	TCE
MCL			2	70	5
Class I Std.	700	700	2	70	5
Class II Std.	700	3500	10	200	25
G11S-02		18			
G11D-02					
US01S-02					
US01D-02					
US03S-02					
US03I-02					
US03D-02			35	18	
US04S-02				44	
US04D-02					
US06S-02					
US06I-02					1J
US06D-02					
W3D-02					
W3SB-02					
W4S-02					
W5S-02					
W6S-02					
W7D-02					

Notes.

Round I Groundwater Samples collected in May/June 1993

Round II Groundwater Samples collected in March 1994

Concentrations reported in micrograms per liter (ug/L)

J - estimated value below detection limit

SVOCs and Pesticides/PCBs were not detected in groundwater samples and are therefore not reported in the Table

The detection limit for VOCs for all samples was 10 ug/l.

Table 6, Page 2 of 2
Summary of Analytical Results
Detected VOCs, SVOCs and Pesticides/PCBs
Remedial Investigation - Private/Village Well Groundwater Samples
H.O.D. Landfill
Antioch, Illinois

Compounds	Groundwater Standards			Sample Designation (Round 1 Sampling)						
	MCL	Class I	Class II	DL	VW3-01	VW5-01	PW1-01	PW2-01	PW3-01	PW5-01
Detected VOCs										
Carbon Disulfide		700	3500	1		0.6J				
Detected SVOCs										
2-Methylphenol		350	350	5		0.5J		0.9J		
4-Chloroaniline				5	0.7J					

Compounds	Groundwater Standards			Sample Designation (Round 2 Sampling)			
	MCL	Class I	Class II	DL	VW3-02	VW4-02	VW5-02
Detected VOCs							
Acetone		700	700	5	11J		
cis-1,2-DCE		70	200	1		6J	
1,2-DCE		70	200	1	0.7J	0.5J	0.8J
Detected SVOCs							
2-Methylphenol		350	350				0.5J
4-Chloroaniline					0.7J		

Notes:
Concentrations reported in micrograms per liter (ug/L)
1,2-DCE - 1,2-Dichloroethene
J - Estimated value below detection limit
Round 1 Samples collected in June\July 1993
Round 2 Samples collected in March 1994 (Private wells not sampled during Round 2 activities)
Pesticides/PCBs were not detected in Private or Village Well Groundwater samples
DL = detection limit

Table 7
Summary of Analytical Results
Detected VOCs, SVOCs and Pesticides/PCBs
Remedial Investigation - Round 1 and 2 Surface Water Samples
H.O.D. Landfill
Antioch, Illinois

	Round 1 Surface Water Samples		
Detected VOCs	SWS101-01	SWS201-01	SWS301-01
2-Hexanone			3J
4-methyl-2-pentanone			2J

	Round 2 Surface Water Samples							
Detected VOCs	SWS101-02	SWS201-02	SWS301-02	SWS401-02	SWS501-02	SWS601-02	SWPSG1-02	SWPSG2-02
2-Hexanone								
4-methyl-2-pentanone								

Notes:
Tentatively Identified Compounds (TICs) not reported in Table
Concentrations reported in micrograms per kilogram (ug/kg)
J - Estimated value below detection limit
SVOCs and Pesticides/PCBs were not detected in Round 1 or 2 surface water samples
VOCs were not detected in samples other than SWS301-01
Round 1 Samples collected in May 1993
Round 2 samples collected in March 1994
The detection limit for all samples was 10 ug/l.

Table 8

Summary of Analytical Results

Detected VOCs, SVOCs and Pesticides/PCBs

Remedial Investigation - Round 2 Sediment Samples

H.O.D. Landfill

Antioch, Illinois

	Sample Designation (Round 2 Sediment Samples)							
Detected VOCs	SDS101-02	SDS201-02	SDS301-02	SDS401-02	SDS501-02	SDS601-02	SDPSG1-02	SDPSG2-02
Detection Limit	**520**	**1500**	**850**	**1100**	**490**	**690**	**2500**	**2100**
Phenanthrene			310J					
Fluoranthene		380J	680J					
Pyrene		370J	580J					
Benzo (a) anthracene			250J					
Chrysene			300J					
bis(2-ethylhexyl)-phthalate		940J	1500J					
Benzo (b) fluoranthene			430J					
Benzo (a) pyrene			290J					

Notes:

Tentatively Identified Compounds (TICs) not reported in Table

Concentrations reported in micrograms per kilogram (ug/kg)

J - Estimated value below detection limit

VOCs and Pesticides/PCBs were not detected in sediment samples

SVOCs were not detected in samples other than SDS201 and SDS301

Samples collected in March 1994

Sediment samples not collected during Round 1 field activities

Table 9
Summary of Analytical Results
Detected VOCs, SVOCs and Pesticides/PCBs
Remedial Investigation - Round 1 Surface Soils Samples
H.O.D. Landfill
Antioch, Illinois

	Sample Designation					
Compounds	**HD-SU01-01**	**HD-SU02-01**	**HD-SU03-01**	**HD-SU04-01**	**HD-SU04-91**	**HD-SU05-01**
Detected VOCs						
Detection Limit	**62**	**14**	**13**	**64**	**13**	**12**
Methylene Chloride	570	59	48	1200	210	
Acetone	140	17	8J		15	
Carbon Disulfide		6J				
Benzene	7J					
Toluene	55J	3J			2J	
Ethylbenzene	240	12J				
Xylenes	280	37				
Detected SVOCs						
Detection Limit	**410**	**420**	**430**	**420**	**430**	**410**
1,4-Dichlorobenzene	130J					
Naphthalene	320J	630				
2-Methylnaphthalene	61J	390J				
Acenaphthene	120J	1,000				
Dibenzofuran	59J	620				
Fluorene	68J	500				
Phenanthrene	250J	240J	120J	36J		51J
Anthracene	46J					
Fluoranthene			160J	59J		73J
Pyrene			110J	52J		54J
bis(2-ethylhexyl)-phthalate	160J	320J	280J	3,500	3,600	9,600
Benzo (b) fluoranthene			110J			
Carbazole	130J					
Detected Pesticides/PCBs						
Detection Limit	**4.1**	**4.5**	**4.3**	**4.2**	**4.3**	**4.1**
4,4'-DDD	4.3					

Notes
Tentatively Identified Compounds (TICs) not reported in Table, TICs results presented in Appendix O-12 of the RI
Concentrations reported in micrograms per kilogram (ug/kg)
J - Estimated value below detection limit
Surface Soils samples not collected during Round 2 RI sampling activities
Samples collected on May 14, 1993

Table 10: Summary of Baseline Risk Assessment Results

Exposure Pathway	RME Excess Lifetime Cancer Risk	Contaminants of Concern (a)	RME Hazard Index	Contaminants of Concern (b)
Child/Teenage Site Trespasser				
Incidental Surface Soil Ingestion	9E-08	NA	LT 1 (1E-03)	NA
Dermal Absorption from Surface Soil	1E-05	Beryllium	LT 1 (1E-02)	NA
Dermal Contact with Surface Water	NE	NA	LT 1 (3E-02)	NA
Incidental Sediment Ingestion	2E-07	NA	LT 1 (1E-02)	NA
Dermal Absorption from Sediment	1E-07	NA	LT 1 (2E-03)	NA
Inhalation of Volatiles from Ambient Air	4E-09	NA	LT 1 (5E-06)	NA
Direct Contact with Carcinogenic PAHs				
Surface Soil	Cancer risk not likely	NA	NA	NA
Sediment	Cancer risk not likely	NA	NA	NA
Total Risk	1E-05	Beryllium	LT 1 (5E-02)	NA
Nearby Adult Resident				
Ingestion of Groundwater				
Off-Site Surficial Sand	5E-05	Beryllium	LT 1 (6E-01)	NA
Off-Site Deep Sand and Gravel	8E-04	Vinyl Chloride	LT 1 (3E-01)	NA
Municipal Wells	9E-05	Arsenic	LT 1 (5E-01)	NA
Private Wells	NE	NA	LT 1 (8E-02)	NA
Inhalation of Volatiles while Showering				
Off-Site Deep Sand and Gravel	6E-05	Vinyl Chloride	NE	NA
Municipal Wells	5E-07	NA	LT 1 (2E-03)	NA
Dermal Absorption While Showering				
Off-Site Surficial Sand	2E-05	Beryllium	LT 1 (2E-02)	NA
Off-Site Deep Sand and Gravel	3E-05	Vinyl Chloride	LT 1 (1E-02)	NA
Municipal Wells	2E-07	NA	LT 1 (5E-03)	NA
Private Wells	NE	NA	LT 1 (4E-04)	NA
Inhalation of Volatiles from Ambient Air	5E-07	NA	LT 1 (3E-04)	NA
Total Risk by Aquifer/Well Type				
Off-Site Surficial Sand	7E-05	Beryllium	LT 1 (6E-01)	NA
Off-Site Deep Sand and Gravel	9E-04	Vinyl Chloride	LT 1 (3E-01)	NA
Municipal Wells	9E-05	Arsenic	LT 1 (5E-01)	NA
Private Wells	5E-07	NA	LT 1 (8E-02)	NA

Information taken from "Baseline Risk Assessment for the H.O.D. Landfill Site Antioch, Illinois," The Weinberg Group, Inc./ICF Kaiser, 1997.

Notes:

1E-03 = 1 X 10^{-3} = 0.001
LT = Less than
NA = Not applicable
NE = Not evaluated since chemicals relevant for this health endpoint were not selected or detected in this data grouping.

(a) Contaminants of Concern are those with RME cancer risks greater than 1.E-06.
(b) Contaminants of Concern are those with RME hazard indices greater than 1.

Table 11: Potential Chemical-Specific ARARs

MEDIA	REQUIREMENT	CITATION
Surface Water	Protect State water for aquatic life, agricultural use, primary and secondary contact use, most industrial use, and to ensure aesthetic quality of aquatic environment.	Water Quality Standards 35 IAC 302.202-302.212
	Pretreatment Standards of State and local POTW	35 IAC 310.201-220, 35 IAC 307.1101-1103
	Effluent Guidelines and Standards	35 IAC 304.102-126
	Prohibition of discharge of oil or hazardous substances into or upon navigable waters	Federal Water Pollution Control Act Section 311(b)(3) 40 CFR 110.6, 117.21
	Comply with all applicable Federal and State water quality criteria.	CWA Section 304(a) and information published in the Federal Register pursuant to this section; 35 IAC 302.612-669
Groundwater	Meet State Groundwater Quality Standards using a Groundwater Management Zone, if appropriate	35 IAC 620.410 unless modified in accordance with the substantive requirements in 35 IAC 620.250 to 350
Air	Air Quality Standards	35 IAC 243.120-126

Table 12: Potential Location-Specific ARARs

MEDIA	REQUIREMENT	CITATION
Floodplains	Action to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values (in relation to implementation of the RA).	Executive Order 11988, Floodplain Management, 40 CFR 6, Appendix A, Section 6(a)(5)
	Facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood	35 IAC 724.118(b)
	Governs construction and filling in the regulatory floodway of rivers, lakes, and streams of Cook, DuPage, Kane, Lake, McHenry, and Will Counties, excluding the City of Chicago	92 IAC Part 708
	Minimum requirements for stormwater management aspects of new development in Lake County	Lake County Stormwater Management Commission Watershed Development Ordinance
Wetlands	Action to minimize the destruction, loss, or degradation of wetlands	Executive Order 11990, Protection of Wetlands, 40 CFR 6, Appendix A, Section 6(a)(5)
	Action to minimize adverse effects of dredged or fill materials	CWA, 40 CFR 230.70-230.77
	Permits for Dredged or Fill Material	CWA Section 404
Stream	Requires Federal agencies involved in actions that will result in the control or structural modification of any stream or body of water for any purpose, to take action to protect the fish and wildlife resources which may be affected by the action	Fish and Wildlife Coordination Act, 40 CFR 6.302(g)
	Action to minimize adverse effects of dredged or fill materials	CWA, 40 CFR 230.70-230.77
	Permits for Dredged or Fill Material	CWA Section 404

Table 13: Action-Specific ARARs

MEDIA	REQUIREMENT	CITATION
Capping	Final cover system: A compacted layer of not less than two feet of suitable material shall be placed over the entire surface of each portion of the final lift not later than 60 days following the placement of refuse in the final lift.	35 IAC 807.305(c)
	Cover stabilization: Residual settlement erosion and control work; mowing	35 IAC 807.622(d)(3)
Post Closure Care	Post Closure Maintenance: Establishes minimum requirements for the maintenance and inspection of the final cover and vegetation	35 IAC 811.111(c)
	Groundwater Monitoring Program: Establishes minimum requirements for groundwater monitoring at the site	35 IAC 811.319(a) and Part 811.318
	Leachate Collection System: Establishes minimum requirements for a leachate collection system at the site	35 IAC 811.308(a)(c)(d)(e)(f)(g)(h)
	Landfill Gas Monitoring Program: Establishes minimum requirements for gas monitoring at the site	35 IAC 811.310
Leachate Treatment Storage and Disposal	Leachate Treatment and Disposal System: Establishes standards for on-site treatment and pre-treatment	35 IAC 811.309(c)(3)(4)(5)(6) Note that this is only applicable for scenarios LT2 and LT3.
	Leachate Treatment and Disposal System: Establishes standards for leachate storage systems	35 IAC 811.309(d)
	Leachate Treatment and Disposal System: Establishes standards for discharge to an off-site treatment works	35 IAC 811.309(e)(1)(3)(4)(5)(6)
	Leachate Treatment and Disposal System: Establishes standards for leachate monitoring	35 IAC 811.309(g)(1)(2)

Table 13: Action-Specific ARARs

Landfill Gas Management	Landfill Gas Management System: Establishes minimum requirements for gas venting and collection systems	35 IAC 811.311
	Visible and particulate matter emission standards and limitations	35 IAC 212.123 (visible) and 212.321 (particulate)
	Sulfur air emissions standards and limitations	35 IAC 214.162
	Organic material emissions standards and limitations	35 IAC 215.143
	Carbon monoxide emissions standards and limitations	35 IAC 216.121, 216.141
	Nitrogen oxide emissions standards	35 IAC 217.121
	Volatile Organic Material emission standards	35 IAC 218.143
	Verify that there is no "excessive release" of hydrogen sulfide emissions during landfill gas management.	35 IAC 211.2090, 35 IAC 214.101
	Verify that emissions of hazardous pollutants do not exceed levels expected from sources in compliance with hazardous air pollution regulations.	415 ILCS 5/9.1(b), CAA Section 112, 40 CFR 61.12-14
Gas Collection	Estimate emission rates for each pollutant expected.	35 IAC 291.202
	Develop a modeled impact analysis of source emissions.	35 IAC 291.206
	Use Reasonably Available Control Technology (RACT).	35 IAC 211.5370, 35 IAC Part 215, Appendix E
Landfill Gas Processing and Disposal	Landfill Gas Processing and Disposal System: Establishes minimum requirements for landfill gas processing and disposal	35 IAC 811.312(a)(b)(c)(d)(e)
	Estimate emission rates for each pollutant expected.	35 IAC 291.202
	Develop a modeled impact analysis of source emissions.	35 IAC 291.206
	Use Reasonably Available Control Technology (RACT).	35 IAC 211.5370, 35 IAC Part 215, Appendix E

Table 13: Action-Specific ARARs

Direct Discharge of Treatment System Effluent	The discharge must be consistent with the relevant Water Quality Management Plan approved by EPA under Section 208(b) of the CWA, and developed by Illinois EPA.	CWA Section 208(b)
	Use of Best Available Technology (BAT) that is economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.	CWA Section 306, 40 CFR 122.44(a), and 35 IAC 301.400
	Discharge limitations must be established for all toxic pollutants that are or may be discharged at levels greater than those that can be achieved by technology-based standards.	CWA Section 307(a), 40 CFR 122.44(e), and 35 IAC 309.152
	The discharge must be monitored to assure compliance. The discharger will monitor: - The mass of each pollutant discharged, - The volume of effluent discharged, and - The frequency of discharge and other measurements as appropriate.	40 CFR 122.44(I) and 35 IAC 309.146(a)
	Approved test methods for waste constituents to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided.	CWA, 40 CFR 122.21
	Duty to mitigate any adverse effects of any discharge	40 CFR 122.41(d)

Table 13: Action-Specific ARARs

Direct Discharge of Treatment System Effluent (continued)	Proper operation and maintenance of treatment and control systems	40 CFR 122.41(e)
	Develop and implement a Best Management Practices (BMP) program to prevent the release of toxic constituents to surface waters. The BMP program must: 1. Establish specific procedures for the control of toxic and hazardous pollution spills, 2. Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure, and 3. Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.	CWA Section 304(e), 40 CFR 125.104
	Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.	40 CFR 136.3
Discharge to Surface Water	Effluent standards which establish maximum contaminant concentrations that may be discharged to the waters of the State	35 IAC 304.101-304.126
Discharge to Sewers	Sewer discharge criteria	35 IAC 307.1101-1103
Discharge to POTW	Prevent introduction of pollutants into POTW which will interfere with POTW operation.	35 IAC 310.201(a)(c) and 310.202, and local POTW regulations

Table 14: Descriptive Summary of All Alternatives

Action Components	Description
No Further Action	
NFA	Under existing IEPA permit, cap maintenance, operation and maintenance of the existing LFG and manual leachate collection systems, and groundwater monitoring activities would be performed.
Capping	
C1	Restoration of Cap: The cap would be restored to the original grades established and approved by the IEPA in the Site Closure Plan. The existing soils would be regraded and/or off-site clay soils would be imported and compacted to fill low areas and repair leachate seeps.
C2	Augmentation of Cap: The existing cover soils would be reworked to form a uniform 35 IAC 807 compliant cap consisting of two feet of compacted clay and 2 feet of additional cover soil.
C3	Reconfiguration/Supplementation of Cap: Existing cover soils would be reworked and supplemented (if necessary) to form a 35 IAC 811 compliant cap with 3 feet of compacted clay and 3 feet of cover soil.
LFG Collection and Treatment	
G1	No Further Action: Continue to passively vent LFG with existing wells and stick flares.
G2	Supplement Existing System: Existing passive flares in new landfill would continue operation. LFG collection/treatment supplemented through addition of an active extraction system in old landfill. Pilot/Pre-design investigation would be conducted.
G3	Activation of LFG System: Existing wells (passive) converted to active wells, additional wells installed in old portion of Site, and LFG conveyed to centralized blower/flare station. Pilot/Pre-design investigation would be conducted.
Leachate Collection	
LC1	No Further Action: Continue to use existing leachate collection points (manual operation).
LC2	Toe-of-Slope Leachate Collection: Toe-of-slope collection piping extended along toe of both old and new section of landfill and existing extraction points used. Automated system.
LC3	Upgrade/Supplement Leachate System: Toe-of-slope piping extended in new section of landfill only. Dual extraction system (leachate/LFG) with blower/flare station constructed on old section of landfill. Pilot/Pre-design investigation would be conducted.
LC4	Active Leachate Extraction: Existing gas and leachate wells in both sections converted to dual extraction wells. Blower/Flare station would be constructed. Pilot/Pre-design investigation would be conducted.
Leachate Treatment/Disposal	
LT1	No Further Action: Continue to directly discharge to licensed POTW.
LT2	Pretreat/Discharge Leachate: Physical/chemical pretreatment of leachate followed by discharge to licensed POTW.
LT3	Pretreat/Surface Discharge Leachate: Full treatment of leachate to NPDES standards followed by remote surface discharge to surface water source (Fox River).
Groundwater Monitoring	
GW1	No Further Action: Continue Groundwater Monitoring Program.
GW2	Monitored Natural Attenuation.

Table 15: Cost Estimate Summary for All Alternatives

	Capital	O&M/Year	PW O&M	Total PW
No Further Action	$923,200	$196,360	$2,436,800	$3,360,000
Capping				
C1	$1,370,000	$72,000	$900,000	$2,270,000
C2	$4,925,000	$72,000	$900,000	$5,825,000
C3 - Supplemental Clay	$6,746,000	$72,000	$900,000	$7,646,000
C3 - Replacement Clay	$9,034,500	$72,000	$900,000	$9,934,500
Gas Extraction/Treatment				
G1 - No Further Action	$231,000	$35,000	$434,400	$665,400
G2	$701,100	$35,000	$434,400	$1,135,500
G3	$924,000	$35,000	$434,400	$1,358,400
Leachate Extraction				
LC1 - No Further Action	$0	$4,000	$49,700	$49,700
LC2	$232,300	$60,000	$744,600	$976,900
LC3	$367,800	$72,000	$893,500	$1,261,300
LC4	$439,000	$60,000	$744,600	$1,183,600
Leachate Treatment				
LT1 - No Further Action	$0	$66,800	$829,000	$829,000
LT2	$476,000	$752,100	$9,333,600	$9,809,600
LT3	$1,843,000	$605,200	$7,510,600	$9,353,600
Groundwater Monitoring				
GW1 - No Further Action	$692,200	$63,000	$781,800	$1,474,000
GW2	$723,600	$69,700	$865,000	$1,588,600

Notes:

1. Present worth (PW) was calculated at a discount rate of seven percent and a 30-year O&M period, equating to a PW factor of 12.41.

2. The capital cost for groundwater monitoring includes $652,800 for VW4 replacement and VW7 installation, and an estimated $39,400 to abandon VW4.

Table 16: Hydrologic Evaluation of Landfill Performance
Summary Output of Infiltration (Average Annual Totals)

	Currently	C1	C1 w/freeze of top 30 centimeters	C1 w/freeze of top 30 centimeters & lateral drainage
Precipitation (in.)	32.89(100%)	32.89(100%)	32.89(100%)	32.89(100%)
Runoff (in.(%))	2.97(9.03%)	9.152(27.8%)	9.154(27.83%)	2.475(7.525%)
Evapotranspiration (in.(%))	28.789(87.53%)	22.103(67.2%)	22.095(67.18%)	22.621(68.77%)
Percolation/ Leakage through Clay Liner (in.(%))	3.95(12.01%)	1.62455(4.94%)	1.62966(4.95%)	1.83317(5.57%)
Lateral Drainage Collected (in.(%))	0(0%)	0(0%)	0(0%)	5.867(17.84%)

		C2	C2 w/freeze of top 30 centimeters	C2 w/freeze of top 30 centimeters & lateral drainage
Precipitation (in.)		32.89(100%)	32.89(100%)	32.89(100%)
Runoff (in.(%))		5.927(18.02%)	5.895(17.92%)	2.009(6.11%)
Evapotranspiration (in.(%))		24.86(75.59%)	24.871(75.62%)	24.923(75.77%)
Percolation/ Leakage through Clay Liner (in.(%))		2.024(6.16%)	2.041(6.21%)	1.864(5.67%)
Lateral Drainage Collected (in.(%))		0(0%)	0(0%)	3.877(11.79%)

		C3	C3 w/freeze of top 30 centimeters	C3 w/freeze of top 30 centimeters & lateral drainage
Precipitation (in.)		32.89(100%)	32.89(100%)	32.89(100%)
Runoff (in.(%))		5.691(17.3%)	5.669(17.24%)	1.902(5.78%)
Evapotranspiration (in.(%))		24.878(75.64%)	24.88(75.65%)	24.799(75.4%)
Percolation/ Leakage through Clay Liner (in.%))		2.153(6.55%)	2.169(6.59%)	1.75(5.32%)
Lateral Drainage Collected (in.%))		0(0%)	0(0%)	4.20(12.77%)

TABLE 17: CAPPING COST ESTIMATE FOR THE SELECTED REMEDY

C1 Capital Costs:

Assume under this alternative that the existing cover soils will be regraded and that new vegetetation will be established.

Mobilization/Demobilization		$15,000
Site Safety Plan		$12,500
Clear/Grub (strip and stockpile topsoil)	(assume 40% of 51 acres @ $1,500/acre)	$30,600
Purchase & install existing well/piezometer protection	(assume $500 per well * 75 wells)	$37,500
Stripping/stockpiling existing soil in low areas (40 % of New LF area, 2' deep)	(34,600 CY * $5 per yd3)	$173,000
Place compacted clay in low area (40% of New LF area, 4' deep)	(69,200 CY * $7 per yd3)	$484,400
Regrade stockpiled soil (40% of New LF area, 2' deep)	(34,600 CY * $5 per yd3)	$173,000
Establish vegetation	(assume 40% of 51 acres @ $1,500/acre)	$30,600
Installation of temporary fencing, riprap, temporary access roads, etc.		$100,000
Construction Completion Report		$25,000
Engineering (10% of capital costs)		$109,000
Estimating Contingency (material delays, weather, etc., assume 15% of total capital)		$179,000
	TOTAL:	$1,370,000

C1 O&M Costs:

Fence repairs and lock replacement - assume $2,500 per year		$2,500
Sign repairs/replacement - assume $300 per year		$300
Mowing - twice per year @ $30/acre		$3,060
Inspection of cover and swales	quarterly @ 8/hr * $50/hour	$1,600
Cleaning of drainage features	quarterly @ 32/hr * $50/hour	$6,400
Rework of cover soils (assume 5%/year needs rework, 3 acres/year @ $5 per yd3 at 2' depth)		$48,400
Engineering Oversight/Coordination - assume 15% of total O&M)		$9,400
	TOTAL O&M/YR:	$72,000

Note: CY = cubic yards

TABLE 18: GAS COLLECTION SYSTEM COST ESTIMATE FOR THE SELECTED REMEDY

CAPITAL CONSTRUCTION AND O&M COST ESTIMATE

Item	Type of Work	Estimated Quantities	Unit	Unit Price	Extended Price
1.	Mobilization/Demobilization	1	LS	$50,000	$50,000
2.	Site Safety Plan	1	LS	$12,500	$12,500
3.	Gas Wells	210	LF	$100	$21,000
4.	Gas Pipe Trenches	11,500	LF	$25	$287,500
5.	Header Riser/Cleanouts	34	EACH	$500	$17,000
6.	Gas Wellheads	34	EACH	$600	$20,400
7.	Knock-Out/Lift Station (KO/LS)	3	LS	$20,000	$60,000
8.	Individual Control Wires (To KO/LSs)	4,200	LF	$2	$8,400
9.	Condensate Pressure Conveyance Pipe	4,200	LF	$7.50	$31,500
10.	Dripleg	1	EACH	$6,000	$6,000
11.	Condensate Holding Tank	1	LS	$25,000	$25,000
12.	Compressor and Control Station	1	LS	$40,000	$40,000
13.	Blower Station	1	LS	$40,000	$40,000
14.	Utility Flare Station	1	LS	$40,000	$40,000
15.	Clear and Grub	0.62	acres	$1,200	$744
16.	Access Road	3000	SY	$5	$15,000
17.	Chainlink Fencing	300	LF	$10	$3,000
18.	Electrical Service Supply	1	LS	$15,000	$15,000

TOTAL Extended Capital Construction Price — $694,000

ADDITIONAL CONSULTING SERVICES

Item	Type of Work	Estimated Quantities	Unit	Unit Price	Extended Price
1.	Construction Completion Report	1	LS	$50,000	$50,000
2.	Bid-Phase Assistance	5% of Cap. Cost	LS	$34,700	$34,700
3.	Construction Management	10% of Cap. Cost	LS	$69,400	$69,400
4.	Engineering	10% of Cap. Cost	LS	$69,400	$69,400

TOTAL Additional Consulting Services Price, Rounded Up to Nearest $10K — $230,000

TOTAL Extended Price — $924,000

O&M COST ESTIMATE

O&M on the active portion of the site would be approximately $25,000 per year	$25,000
Maintenance on the existing gas flares would be approximately $10,000 per year	$10,000
	$35,000

Use a 30-year timeframe to calculate present worth for O&M:
$35,000 * 12.41(7%, 30 years) = $434,400 — $434,400

Note:
LS = lump sum
LF = linear foot
SY = square yard

TABLE 19: LEACHATE COLLECTION SYSTEM COST ESTIMATE FOR THE SELECTED REMEDY

CAPITAL CONSTRUCTION AND O&M COST ESTIMATE

Item	Type of Work	Estimated Quantities	Unit	Unit Price	Extended Price
1.	Mobilization/Demobilization	1	LS	$50,000	$50,000
2.	Site Safety Plan	1	LS	$12,500	$12,500
3.	Gas Wells	210	LF	$100	$21,000
4.	Gas Pipe Trenches	11,500	LF	$25	$287,500
5.	Leachate Gravity Conveyance Pipe	11,500	LF	$5	$57,500
6.	Header Riser/Cleanouts	34	EACH	$500	$17,000
7.	Gas/Leachate Wellheads	34	EACH	$600	$20,400
8.	Well Pumps w/ Transmitter /Controls	34	EACH	$3,500	$119,000
9.	Knock-Out/Lift Station (KO/LS)	3	LS	$20,000	$60,000
10.	Individual Control Wires (To KO/LSs)	4,200	LF	$2	$8,400
11.	Leachate Pressure Conveyance Pipe	4,200	LF	$7.50	$31,500
12.	Dripleg	1	EACH	$6,000	$6,000
13.	Condensate/Leachate Holding Tank	1	LS	$25,000	$25,000
14.	Compressor and Control Station	1	LS	$40,000	$40,000
15.	Blower Station	1	LS	$40,000	$40,000
16.	Utility Flare Station	1	LS	$40,000	$40,000
17.	Clear and Grub	0.62	acres	$1,200	$744
18.	Access Road	3000	SY	$5	$15,000
19.	Chainlink Fencing	300	LF	$25	$7,500
20.	Electrical Service Supply	300	LS	$15,000	$15,000
21.	System Automation	15% of Cap. Cost	LS	$15,000	$132,000
	TOTAL Extended Capital Construction Price				$1,010,000

ADDITIONAL CONSULTING SERVICES

Item	Type of Work	Estimated Quantities	Unit	Unit Price	Extended Price
1.	Construction Completion Report	1	LS	$50,000	$50,000
2.	Bid-Phase Assistance	10% of Cap. Cost	LS	$101,000	$101,000
3.	Construction Management	10% of Cap. Cost	LS	$101,000	$101,000
4.	Engineering	10% of Cap. Cost	LS	$101,000	$101,000
	TOTAL Extended Capital Construction Price				$353,000
	TOTAL Extended Price				$1,363,000

Total capital cost of $1,363,000 is for the dual leachate and gas collection system. The additional cost for the leachate system is equal to the cost of the dual extraction system minus the cost of the gas collection system:
$1,363,000 - $924,000 = $439,000 **$439,000**

O&M Cost Estimate

Assume O&M costs of $60,000 per year, based on previous experience. **$60,000**
Present worth of O&M = $60,000 , 7%, 30 years) = $744,600 **$744,600**

Note:
LS = lump sum
LF = linear foot
SY = square yard

TABLE 20: LEACHATE TREATMENT SYSTEM COST ESTIMATE FOR THE SELECTED REMEDY

<u>LT1 - No Further Action; Pump, Transport, & Dispose at Remote POTW</u>

Assume the total cost of pumping leachate from the existing manholes and wells is approximately equal to the present worth of transport/discharge costs for 30 years.

Assume that the current extraction rate is 1 gpm and that the cost for transport using a 5,000 gallon tanker truck and discharge to the POTW combined is $0.09/gallon.

Annual O&M Costs:

Annual O&M = ((1 gal/min) * (60 min/hr) * (24 hr/day) * (365 day/yr) * $0.09/gal) + 20% Contingency = $56,800
Additional annual operation cost for this option is approximately $10,000

Annual O&M = $56,800 + $10,000 = $66,800

Calculate Present Worth of this option over 30 years

O&M P.W. (7%, 30 years) = $829,000

TABLE 21: GROUNDWATER MONITORING SYSTEM COST ESTIMATE FOR THE SELECTED REMEDY

GW-2 - Monitored Natural Attenuation

<u>Capital Costs</u>		$692,200
Replacement of VW4 with VW7		
Pre-Design Investigation Monitoring Wells		$21,250
Well Inst., 2 double cased wells*85 ft.*$125/ft =		$9,200
Field Oversight, 10 days*10hr/day*$92/hr =		$920
Contract Mgt./Admin., 10 hrs * 92/hr =	**Total Capital Costs:**	$723,600

<u>O&M Costs</u>		
Quarterly Sampling: Assume sampling of 20 wells	$9,920	
Labor, 20 wells*(1d/8 wells)*(8hr/d)*($62/hr*2)*4/yr =	$960	
Travel Expenses, (5d * $40/d + $40)*4/yr =	$2,800	
Equipment/Supplies, assume 4*$700 =		
Laboratory Analysis of Samples: Assume $550/well	$44,000	
$550/well * 20 wells * 4/yr =		
Quarterly Reporting	$1,984	
Data Prep, ($62/hr * 8hrs)*4 =	$1,408	
CAD/Admin, ($44/hr * 8hrs)*4 =	$7,104	
Report Writing/Data Interpretation ($74/hr * 24)*4 =	$1,472	
QA/QC ($92/hr * 4hrs) *4 =		
Total Annual Cost	$69,700	
Present Worth (7%, 30yrs) :		$865,000
TOTAL:		$1,588,600

Costs incurred to abandon and replace VW4

Well Abandonment Cost		$4,800
Engineering/Consulting ($74/hr * 40hrs + $92/hr*20hrs)=		$1,960
CAD/Administrative Support ($54/hr*20h + $44/hr*20h) =		$7,500
Bid-phase costs (Assume $7,500)		$7,500
Mobilization/Demobilization/Labor ($2,500 + $50/hr*2*50) =		$10,000
Misc. material/subconsulting costs (Assume $10,000)=		$2,400
Letter Report/Agency Communication ($74/hr*20hr + $92/hr * 10 hr) =	**SUBTOTAL1:**	$34,200
	Assume a 15% contingency factor :	$5,200
	SUBTOTAL2:	$39,400

Well Replacement Cost		
based on actual costs		
		$7,040
Property purchase		$76,012
Well replacement		$1,355
Additional field investigation assistance		$77,963
Well production		$490,356
Well hook-up (includes capital & commodity charges)		
	SUBTOTAL3:	$652,800
	TOTAL:	$692,200

Table 22: Groundwater Cleanup Standards

620.410 Groundwater Quality Standards for Class I: Potable Resource Groundwater

a) Inorganic Chemical Constituents

Except due to natural causes or as provided in Section 620.450, concentrations of the following chemical constituents must not be exceeded in Class I groundwater:

Constituent	Units	Standard
Antimony	mg/L	0.006
Arsenic	mg/L	0.05
Barium	mg/L	2
Beryllium	mg/L	0.004
Boron	mg/L	2
Cadmium	mg/L	0.005
Chloride	mg/L	200
Chromium	mg/L	0.1
Cobalt	mg/L	1
Copper	mg/L	0.65
Cyanide	mg/L	0.2
Fluoride	mg/L	4.0
Iron	mg/L	5
Lead	mg/L	0.0075
Maganese	mg/L	0.15
Mercury	mg/L	0.002
Nickel	mg/L	0.1
Nitrate as N	mg/L	10
Radium-226	pCi/l	20
Radium-228	pCi/l	20
Selenium	mg/L	0.05
Silver	mg/L	0.05
Sulfate	mg/L	400
Thallium	mg/L	0.002
Total Dissolved Solids (TDS)	mg/L	1,200
Zinc	mg/L	5

b) Organic Chemical Constituents

Except due to natural causes or as provided in Section 620.450 or subsection (c), concentrations of the following organic chemical constituents shall not be exceeded in Class I groundwater:

Constituent	Standard (mg/L)
Alachlor*	0.002
Aldicarb	0.003
Atrazine	0.003
Benzene*	0.005
Benzo(a)pyrene*	0.0002
Carbofuran	0.04
Carbon Tetrachloride*	0.005
Chlordane*	0.002
Dalapon	0.2
Dichloromethane*	0.005
Di(2-ethylhexyl)phthalate*	0.006
Dinoseb	0.007
Endothall	0.1
Endrin	0.002
Ethylene Dibromide*	0.00005
Heptachlor*	0.0004
Heptachlor Epoxide*	0.0002
Hexachlorocyclopentadiene	0.05
Lindane (Gamma-Hexachlorocyclohexane)	0.0002
2,4-D	0.07
ortho-Dichlorobenzene	0.6
para-Dichlorobenzene	0.075
1,2-Dibromo-3-Chloropropane*	0.0002
1,2-Dichloroethane*	0.005
1,1-Dichloroethylene	0.007
cis-1,2-Dichloroethylene	0.07
trans-1,2-Dichloroethylene	0.1
1,2-Dichloropropane*	0.005
Ethylbenzene	0.7
Methoxychlor	0.04
Monochlorobenzene	0.1
Pentachlorophenol*	0.001
Phenols	0.1
Picloram	0.5
Polychlorinated Biphenyls(PCB's)(as decachloro-biphenyl)*	0.0005
Simazine	0.004
Styrene	0.1
2,4,5-TP (Silvex)	0.05
Tetrachloroethylene*	0.005
Toluene	1
Toxaphene*	0.003
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
1,2,4-Trichlorobenzene	0.07
Trichloroethylene*	0.005
Vinyl Chloride*	0.002
Xylenes	10

*Denotes a carcinogen.

c) Complex Organic Chemical Mixtures

Concentrations of the following chemical constitutents of gasoline, diesel fuel, or heating fuel must not be exceeded in Class I groundwater:

Constituent	Standard (mg/L)
Benzene*	0.005
BETX	11.705

*Denotes a carcinogen.

d) pH: Except due to natural causes, a pH range of 6.5 - 9.0 units must not be exceeded in Class I groundwater.

e) Beta Particle and Photon Radioactivity

1) Except due to natural causes, the average annual concentration of beta particle and photon radioactivity from man-made radionuclides shall not exceed a dose equivalent to the total body organ greater than 4 mrem/year in Class I groundwater. If two or more radionuclides are present, the sum of their dose equivalent to the total body, or to any internal organ shall not exceed 4 mrem/year in Class I groundwater except due to natural causes.

2) Except for the radionuclides listed in subsection (e)(3), the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalent must be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data in accordance with the procedure set forth in NCRP Report Number 22, incorporated by reference at in Section 620.125(a).

3) Except due to natural causes, the average annual concentration assumed to produce a total body or organ dose of 4 mrem/year of the following chemical constituents shall not be exceeded in Class I groundwater:

Constituent	Critical Organ	Standard (Pci/l)
Tritium	Total body	20,000
Strontium-90	Bone marrow	8

(Source: Amended at 18 Ill. Reg. 14084, effective August 24, 1994)

APPENDIX A: RESPONSIVENESS SUMMARY

SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the United States Environmental Protection Agency (USEPA) to respond "to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. The Responsiveness Summary covers concerns expressed by the public and potentially responsible parties (PRP) in written and oral comments received by USEPA about the proposed remedy for the H.O.D. Landfill Site.

A. Overview

1. Proposed Plan

The Final Remedial Investigation (RI) Report, which was prepared by Montgomery Watson (a Waste Management of Illinois (WMII) contractor), was released to the public in May, 1997. (WMII is one of the PRPs.) The Final Baseline Risk Assessment (BLRA), which was prepared by ICF Kaiser Engineers, Inc. and the Weinberg Consulting Group (which are or were WMII contractors), was released to the public in November, 1997. The Final Feasibility Study (FS), which was prepared by Montgomery Watson, was released to the public in July, 1998. A Fact Sheet summarizing the FS and Proposed Plan was released to the public in July, 1998, and was mailed directly to the PRPs and to residents near the Site.

The Proposed Plan for the remedial action included the No Further Action alternative, and capping, gas collection and treatment, leachate collection, leachate treatment, and groundwater monitoring alternative components. The preferred alternative in the Proposed Plan called for waste cap improvements, upgraded gas collection/treatment and leachate collection systems, leachate treatment, groundwater monitored natural attenuation, and institutional controls.

2. Public Comment Period

The Administrative Record file for the Site was made available for review by the public at the Antioch Public District Library in Antioch, and at USEPA Region 5 offices in Chicago, during and before the public comment period. The public comment period ran from July 22 through August 20, 1998.

An announcement regarding the public comment period and the public meeting was published in the Daily Herald newspaper on July 22, 1998 and in the Antioch News Reporter newspaper on July 24, 1998.

A public meeting was held in Antioch on August 11, 1998. At this meeting, attended by approximately 40 members of the public, representatives from USEPA summarized the findings of the RI/FS and the Proposed Plan, described the remedy selection process, answered questions from the public, and accepted statements from members of the public. Comments, including formal statements from community members, were recorded by a court reporter, and a transcript of the meeting is included in the Administrative Record.

A total of six written submittals was received from the public during the public comment period. This included written comments from PRPs (WMII and the Village of Antioch). Public comments recorded during the public meeting and a comment from the United States Army Corps of Engineers are included in this Responsiveness Summary, but are not included in the count of six written submittals from the public.

Responses to all of the above-mentioned comments are contained in this Responsiveness Summary.

B. Community Involvement

Based on the assessments of the release of hazardous substances at the Site, the Site was proposed for inclusion on USEPA's National Priorities List (NPL) for Superfund Sites in 1985, and was finalized on the NPL in February, 1990. A Community Relations Plan was developed in 1993 to ensure that the public was well informed during the Superfund process. As part of this process, residents near the landfill were interviewed to find out their concerns. The main concerns were drinking water safety, property values, and being kept informed of future Site events.

To respond to these concerns, USEPA produced a fact sheet and held public information meetings in 1993. In April, 1993, USEPA issued a press release announcing the start of the RI by WMII. In December, 1997, USEPA met with Village of Antioch officials in Antioch to provide an update of Site-related activities and to discuss the Village's concerns.

C. Summary of Significant Comments

The public comments for the Site are organized into the following categories:

- Comments from Christine Gustafson. Ms. Gustafson is a resident near the Site;

- A summary of comments from the remainder of the local community on the RI/FS, BLRA, Proposed Plan, and Superfund process;

- A summary of comments from PRPs concerning the RI/FS, BLRA, and the Proposed Plan; and

- A comment from the United States Army Corps of Engineers.

Some of the original comments have been paraphrased or combined to present a more readable document. The reader is referred to the Administrative Record for the Site, located at the Antioch Public District Library in Antioch and at the USEPA Region 5 Office in Chicago, which contains copies of all written comments submitted. The Administrative Record also contains a copy of the public meeting transcript. The Administrative Record Index is included in Appendix B of this Record of Decision (ROD).

Comments from the Community

Comments from Christine Gustafson

1. Ms. Gustafson requested information on the Cunningham and Quaker dump.

USEPA Response: The former Cunningham/Quaker Village Dump is located west of and adjacent to the H.O.D. Landfill. This property is not part of the H.O.D. Landfill, and is not owned by WMII. Since the former Cunningham/Quaker Dump is not part of the H.O.D. Landfill, the Cunningham/Quaker dump was not part of the investigative or decision-making processes used by USEPA to arrive at the selected remedy for the H.O.D. Landfill. Consequently, USEPA has no further information on the former Cunningham/Quaker Village Dump.

2. What past or current businesses that were or are located in or near Antioch's Industrial Park near the Site have had storage violations and have needed USEPA and/or Local Emergency and Hazardous Materials personnel intervention and response?

USEPA Response: The USEPA does not consider this question pertinent to the discussion of the planned remedial activities for the Site.

3. What is the chemistry of vinyl chloride and other volatile organic chemicals (VOC) as they relate to the Site?

USEPA Response: The VOCs such as tetrachloroethylene (PCE), tetrachloroethane (PCA), trichloroethane (TCA), trichloroethylene (TCE), and dichloroethylene (DCE) all may naturally degrade to vinyl chloride, then to carbon dioxide and water. Degradation rates vary based on different situations. For the vinyl chloride found in the groundwater of well US3D, USEPA expects the concentrations to attenuate over time, based on the expected effectiveness of the remedy to minimize further contaminant migration from the waste mass to the groundwater.

4. What types of geological surveys were used to show what geological conditions are capable of attenuation and to show the location of the contaminant plume? What individuals or agencies were involved?

USEPA Response: USEPA's premise that natural attenuation will occur in the groundwater is based on characteristics such as Site groundwater contaminants and concentrations, extent of the contamination, and expected effectiveness of the remedy in reducing contaminant migration into the groundwater. Based on groundwater monitoring results, a groundwater contaminant plume has not been identified. (Contaminants, once entrained in saturated groundwater flow, tend to form plumes of contaminated groundwater downgradient of the contaminant source until they attenuate to a minimum quality level. This is analogous to smoke from a smokestack as it drifts downwind in the atmosphere. This condition has not been found at the Site.) The pre-design investigation, as part of the selected remedy, will further study the extent, if any, of a groundwater contaminant plume. The USEPA had and continues to have overall Site approval authority for investigative and remedial work, and has benefited from the services of various agencies, contractors, and WMII to conduct such work.

5. Have free products in saturated soils and any leaking containers been removed?

USEPA Response: The USEPA's Superfund activities for the Site have not included any removal activities.

6. Is there free product in or on the groundwater?

USEPA Response: No USEPA investigative studies have shown free product to be present in or on the groundwater.

7. Is the (groundwater contaminant) plume increasing, decreasing, or stable? What properties have been or will be affected by the plume? How long will the plume exist?

USEPA Response: No groundwater plume has yet been identified. The pre-design investigation, as part of the selected remedy, will further study the extent, if any, of a groundwater contaminant plume.

8. What municipal, and current and future private wells are or could be (contaminant) receptors?

USEPA Response: The BLRA showed that the drinking of vinyl chloride-contaminated water posed the only significant health risk. No municipal or private wells sampled during the RI showed vinyl chloride levels in the groundwater, and Village Well Four showed vinyl chloride levels up to year 1989. This well has since been decommissioned. The USEPA does not expect municipal or private wells to be adversely impacted by Site contamination.

9. What mechanism or mechanisms are controlling plume size?

USEPA Response: A groundwater contaminant plume has not been identified. The pre-design investigation, as part of the selected remedy, will further study the extent, if any, of a groundwater contaminant plume.

10. How will natural attenuation occur, and what is the monitoring plan?

USEPA Response: The selected remedy will minimize contaminant migration from the waste mass into the groundwater. The existing vinyl chloride and other VOCs in the groundwater are expected to attenuate over time as part of the natural degradation process. See response number 3. The groundwater monitoring plan will be issued as part of the upcoming Remedial Design (RD). For a general description of the GW2 groundwater monitoring component of the selected remedy, see Section VII of this ROD.

11. What is the plan if the concentration and areal extent of the contaminant plume is not maintained or reduced?

USEPA Response: Should a groundwater contaminant plume be found that cannot be maintained or reduced, active groundwater remediation, such as a pump and treat system, will be considered.

12. What other containment methods can be used besides (those included in the selected remedy), such as a Waterloo Containment Barrier?

USEPA Response: Since USEPA followed its presumptive remedy guidance, USEPA did not consider all containment remedies. The USEPA believes that the selected remedy components of waste cap improvements, leachate and gas collection, leachate treatment, groundwater monitored natural attenuation, and institutional controls will be sufficient to protect human health and the environment.

13. What other reductive methods can be used for the contaminants detected in well US3D, and in municipal and private wells (besides blending or diluting)?

USEPA Response: The USEPA included monitored, natural attenuation in its selected remedy as a method of reducing VOC contaminant levels in the groundwater. Active groundwater remediation will be considered if natural attenuation does not occur over time.

14. What is the extent of the contamination in the groundwater?

USEPA Response: Based on the results of the RI, groundwater contamination is limited. Table 6 in this ROD summarizes the analytical results of the groundwater organic sampling during the RI. (The BLRA showed that the only significant health risk was from the ingestion of vinyl chloride-contaminated groundwater. This risk was associated with contaminant levels from well US3D, near and southwest of the Site. Vinyl chloride is a VOC.) Wells with a "D" designation indicate sampling from the deep sand and gravel aquifer, wells with an "I" designation indicate sampling from the clay diamict, and wells with an "S" designation indicate sampling from the surficial sand aquifer. The RI Report documented that poor hydraulic communication exists between the surficial sand, and deep sand and gravel aquifers. Section V of this ROD also documents groundwater contamination levels found during the RI.

15. For exposure to VOCs while showering, aren't the risks to infants, children, elderly, and the health-impaired significant, especially for private well systems that do not get diluted or treated water?

USEPA Response: The results of the RI showed that VOCs were not detected above detection limits for the private and village wells sampled. Based on this finding, the question is not applicable to Site-related issues.

16. What types of special requirements are in effect from State, County, or local governments for current and future private wells that may be affected by Site-related contaminants? Who manages the programs, and how often are the private wells tested?

USEPA Response: Based on the results of the RI and BLRA, USEPA found that there are no significant, Site-related risks for ingesting private well water. This conclusion is consistent with recent Lake County Health Department analytical results from sampling private well water.

The Lake County Health Department performs annual testing and analysis of Safe Drinking Water Act inorganic and organic chemicals for selected private well owners near the Site in unincorporated Lake County. The Village of Antioch does not have a monitoring program in place for private wells.

The Lake County Health Department is expected to continue its private well monitoring program.

The Village of Antioch also has ordinances in effect that prohibit installation of private wells within Village limits.

17. Do sellers' or agents' disclosure requirements dictate that sellers or agents notify potential property purchasers that there is a Superfund Site in Antioch? Is a disclosure document required to be signed by the purchaser and filed with Lake County?

USEPA Response: The USEPA is not aware of local disclosure requirements. The USEPA recommends that the local governments such as Lake County or the Village of Antioch be contacted for such information.

18. When organic compounds are mixed with chlorinated compounds, don't they make new chlorinated hydrocarbons?

USEPA Response: The USEPA cannot respond to this general question without more information, such as the specific types of organic and chlorinated compounds under consideration.

19. Doesn't the Antioch water treatment plant use chlorination, and can ozonation or ultraviolet treatment be used instead?

USEPA Response: The USEPA recommends that the Village of Antioch or the Illinois Environmental Protection Agency (IEPA) be contacted to determine what water treatment methods are used by the Village of Antioch. The USEPA has delegated responsibility for direct oversight of Illinois public water suppliers, such as the Village of Antioch, to IEPA.

Since the Village of Antioch is currently in compliance with the IEPA drinking water program, and there is no evidence of contamination of drinking water from the Site, the use of alternate water treatment methods is not an issue at this time.

20. What treatment methods can private well owners use to reduce contaminant concentrations in the water to safe levels? Will private well owners be provided with home treatment systems? If so, who will provide and pay for the systems? Who will be required to test and maintain the efficiency of the systems?

USEPA Response: Based on the results of the RI and BLRA, USEPA found that there are no significant, Site-related risks from ingesting private well water. Therefore, USEPA has no plan to recommend or provide home treatment systems for private well owners to reduce Site-related contaminant concentrations.

21. What type of program is being implemented to educate children to the dangers of the Site and to the fluoranthane detected above guidance levels in Sequoit Creek sediments?

USEPA Response: The USEPA has not implemented any specific program to explain the dangers of the Site to children. It should be noted that the only danger above risk-based guidance levels identified in the BLRA is through the ingestion of vinyl chloride-contaminated drinking water. This was a result of readings from monitoring well US3D, which is prohibited for drinking water use. The BLRA quantified risk levels associated with dermal contact of Sequoit Creek surface water to be well below the $1 \text{ X } 10^{4}$ carcinogenic level used by USEPA to determine whether remedial action generally is warranted. Furthermore, the contaminant levels for fluoranthene estimated during RI sediment sampling were below detection limits.

Site access controls will be enhanced to prevent children from trespassing on-site. These controls include fencing with barbed wire, warning signs, and gates with locks. Since most of Sequoit Creek is beyond the Site borders, and since contaminant levels of Sequoit Creek were found during the RI to be low, no Site-related access restrictions will exist for Sequoit Creek beyond those imposed at Site boundaries.

22. Is the Wetlands Restoration and Pathway Project a part of the cleanup actions? What

agency and people are doing the project?

USEPA Response: This project is not part of the remedial action. For more information on this project, please call USEPA Region 5's Watershed and Non-point Source Programs Branch at 312-353-2308.

23. What will be done to prevent accidental trespass of 6 to 16-year old children to Sequoit Creek and its sediments, as well as to the Site?

USEPA Response: Please see the response to comment number 21.

24. Access to the Site from Depot Street, which is north of the Site and runs east and west, is not blocked. How and when will this access be blocked?

USEPA Response: Specifics of the "site access restrictions" component of the selected remedy will be evaluated by USEPA during the RD. All access to the Site will be prohibited by the public until cleanup levels are reached, at the earliest.

25. What contaminants are in Little Silver Lake and its sediments? What are the contaminant levels, and where are the contaminants located?

USEPA Response: Little Silver Lake was not within the geographical boundaries included in Superfund Site investigations; therefore, USEPA cannot respond to this question.

26. What is wrong with the surface water body that is west of Deeplake Road and south of Depot Street?

USEPA Response: This surface water body was not within the geographical boundaries included in Superfund Site investigations; therefore, USEPA cannot respond to this question.

27. Why was no radiation detected at the Site? Doesn't waste in the landfill emit iodizing radiation as the waste decays? Who tested the landfill for radiation, and what method and instruments were used?

USEPA Response: In 1987, Ecology and Environment, a USEPA contractor, tested the Site for radiation, and found that radiation levels at the Site were not above background levels. The contractor used a miniature radiation detector, known as a "rad-mini."

28. Why aren't the photos taken of the stressed vegetation and surface seeps on the landfill a part of the information repository at the Antioch Public District Library? Why aren't the photos of the standing water with apparent, stressed vegetation a part of the information repository at the Antioch Public District Library? Where are these photos, and who has them?

USEPA Response: Any photographs taken that were part of the USEPA-authorized Site investigations should be part of the information repository. If the photographs are part of the USEPA-authorized Site investigations and are missing from the information repository, USEPA will attempt to locate the photographs and send copies to the information repository.

29. What intolerant species were found and identified during the biological assessment of the landfill? What Standard of Methods was used, and by whom? What other Natural Areas had biological assessments off-site, by whom, and what Standard of Methods were used, and when did the assessments occur?

USEPA Response: Chapter six of the August 31, 1994 BLRA (approved with addenda by USEPA in October, 1997) documents the ecological risk assessment for the Site. This assessment describes the methods used and species identified. Please refer to the ecological risk assessment of the BLRA for the requested information. The BLRA is found in the information repository at the Antioch Public District Library.

The ecological risk assessment covered Site-related concerns. The USEPA does not consider the discussion of other off-site, biological assessments to be relevant to the selected remedy for the Site.

30. When was the notice of the public comment period published, and in what newspapers? Did the notice contain information on where comments should be sent and by when? Were television stations or radio stations notified?

USEPA Response: An advertisement was published in the Daily Herald newspaper on July 22, 1998 and in the Antioch News Reporter newspaper on July 24, 1998, announcing that USEPA issued the Proposed Plan for the Site, and that the Proposed Plan was available in the information repository. The advertisement announced the date, time, and location of the public meeting. The advertisement also documented the time period for USEPA to accept written comments, and where the comments should be sent. Television stations and radio stations were not directly notified.

Comments from Other Private Citizens

31. An employee of the Antioch Community High School District 117 sent a written comment to USEPA that described the implementation of a system where the gas generated from a landfill was piped to a school and converted to heating fuel for the school. The writer asked that USEPA give such a system consideration to potentially supply landfill gas from the Site to the Antioch Community High School, where the gas would be converted to heating fuel.

USEPA Response: The USEPA appreciates the community's interest in remediation technologies. The USEPA will discuss this proposal with WMII and/or with any contractors involved in the RD.

The USEPA cautions the commenter that the proposed system is not without concerns, one of which is the safety of boiler emissions from the school.

32. A commenter was concerned about the amount of heavy metals, such as arsenic, beryllium, and thallium in the landfill, and wanted the concentrations of heavy metals to be monitored. He was also concerned that inorganic arsenic compounds, such as lead arsenate, can be converted into organic arsenic compounds that should also be monitored.

<u>USEPA Response:</u> The BLRA identified no significant risk associated with Site-related, heavy metals, including lead and arsenic. However, the groundwater monitoring component of USEPA's selected remedy includes monitoring for heavy metals. The list of contaminants to be monitored in the groundwater will likely not include lead arsenate, because the BLRA did not identify this compound as posing a significant risk, and because this compound is not included in the list of contaminants in the Illinois Groundwater Quality Standards.

33. The same commenter felt that, based on all the contaminants found on-site, the groundwater monitoring frequency in the selected remedy should be no less frequent than quarterly.

<u>USEPA Response:</u> The applicable or relevant and appropriate requirement (ARAR) for the groundwater monitoring program is 35 Illinois Administrative Code (IAC) 811.319. This states that the monitoring frequency will be quarterly, except for organic chemicals, where the monitoring frequency will be annual. However, this ARAR allows for less or more frequent monitoring than quarterly, based on contaminant conditions. The USEPA's selected remedy calls for quarterly monitoring until the USEPA Five Year Review occurs, at which time USEPA will evaluate monitoring data to determine appropriate monitoring frequencies for the next time period in question.

34. The same commenter questioned how the Site would ever be delisted from the NPL, based on the contaminant level of heavy metals on-site.

<u>USEPA Response:</u> According to section 300.425 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the following criteria must be met before a site is deleted from the NPL:

a. PRPs or other persons have completed all response actions required,

b. The State must concur on the proposed deletion,

c. All appropriate Superfund-financed responses are complete, and no further response from PRPs is appropriate, and

d. The Site poses no significant threat to public health or the environment, and taking remedial measures is not appropriate.

The USEPA will consider these four criteria before delisting the Site. If, after deletion from the NPL, a release from the Site merits further remedial response, the Site may be restored to the NPL. The USEPA does not anticipate the Site being delisted in the near future.

35. All chemicals, not only vinyl chloride, should be considered before deciding what type of remedial action is required.

USEPA Response: The USEPA used proper screening methods to develop Site contaminants of concern. Therefore, many contaminants were evaluated during the investigative process. According to the BLRA, only vinyl chloride posed a significant risk to human health. The components of the selected remedy will reduce contaminant concentrations of many Site contaminants including vinyl chloride.

36. A commenter challenged the claim by USEPA that groundwater flow at and near the Site is southwesterly. He asked if the groundwater flow direction could be restudied.

USEPA Response: The USEPA's understanding of a southwesterly groundwater flow direction is based on the results of the RI. It is possible that groundwater flow direction has changed since the RI. However, should USEPA obtain information to show that groundwater flow direction is other than southwesterly, this information will not fundamentally change USEPA's selected remedy for the Site. The USEPA will consider groundwater flow direction before approving the groundwater monitoring plan, which is part of the RD. The groundwater monitoring plan will cover groundwater monitoring locations.

37. A commenter was concerned about the vinyl chloride in the groundwater, and its effect on local ground water supplies. Money should be set aside for monthly testing of VOCs and synthetic organic chemicals (SOC) for each of the village wells, and the results should be published in the local newspapers. Currently, the Village is not required to test the (village wells) for VOCs and SOCs other than the annual State requirement. Because of the present situation, it is extremely important that the Antioch residents be assured of safe water.

In demonstrating its commitment to public health protection and the public's right to know about local environmental information, USEPA is requiring water suppliers to put annual drinking water quality reports into the hands of their customers. These consumer confidence reports will enable Americans to make practical, knowledgeable decisions about their health and their drinking water. The reporting of monthly testing will surely convey public confidence in the USEPA.

USEPA Response: The Village of Antioch has been monitoring for organic and inorganic chemicals in its village wells, in accordance with the IEPA requirements for community water systems. Currently, the Village has an IEPA waiver in effect for most VOCs and SOCs, to monitor every three years. The exception is the newly installed Village Well Seven, which is monitored quarterly for VOCs and SOCs, and annually for inorganic compounds. The IEPA reviews the results of the Village's monitoring, and will alert USEPA if IEPA feels that the Village's public water supply is adversely affected by Site contamination. Also, results of the RI showed that no village wells monitored as part of the RI had organic contaminant levels above detection levels. At this time, USEPA does not believe that monthly monitoring for organic chemicals is warranted.

Should USEPA find (through IEPA or otherwise) that Site contamination is adversely affecting Antioch's public water supply, USEPA will work with IEPA and the Village of Antioch to take corrective action.

The Village of Antioch noted during the public meeting that groundwater analytical results are available on request from the Village.

38. An employee of the Antioch Township stated he had environmental concerns about Sequoit Creek Channel by Pedersen Marina, and wanted the soil to be tested where the channel empties into the Chain-O-Lakes, to determine if runoff could be harmful to the environment.

USEPA Response: The BLRA showed that soil, surface water, and sediment-related exposure pathways resulted in no significant health risks. The surface water and sediment pathways were those from Sequoit Creek. Should USEPA become aware of credible findings to the contrary, it will take appropriate action and will inform the community of this action.

Comments from PRPs

Comments from Waste Management of Illinois, Inc. (WMII)

39. The BLRA quantified the current or potential future threats to human health and the environment that may be posed by chemicals originating at or identified in the vicinity of the Site. The BLRA used data and information obtained during the RI. The BLRA was prepared according to Agency guidance. That methodology significantly overestimates the actual risks associated with the Site for the following reasons:

a. The potential risks within each identified pathway scenario were calculated using reasonable maximum exposure (RME) protocols only. As indicated, the derived risks represent maximum values. This evaluation, instead of the most likely exposure (MLE) protocol, produces very conservative estimates of risk. Many risk assessments use both protocols to establish a range of risks. It is likely that if MLE risk estimates were used, the results of the BLRA would indicate that the quantified risks fall below the Agency's action level(s).

b. Only the hypothetical future use of vinyl chloride-impacted groundwater from the off-site deep sand and gravel aquifer exceeded the established cancer risk guideline (1×10^{-4}) used to determine if corrective action is warranted. The total calculated cumulative RME risk associated with vinyl chloride was 9×10^{-4}. A Village of Antioch ordinance requires properties within the Village limits to connect to the municipal water supply system. Reportedly, the municipal water system currently provides clean water to its users. Vinyl chloride was detected in only one off-site monitoring well, US3D, which is downgradient of the Site, in the industrial park.

c. The RME risk attributable to vinyl chloride was calculated using the maximum detection found in the off-site deep sand and gravel aquifer (at US3D), during sampling in March, 1994. The concentration detected at that time was 35 micrograms per liter. The highest off-site concentration of vinyl chloride detected during subsequent sampling, in March 1998, was 15 micrograms per liter. Therefore, the risks attributable to vinyl chloride in the BLRA are overstated based on current conditions. The 50% reduction in the maximum vinyl chloride concentration would result in an RME risk within USEPA's range of acceptability.

d. Hazardous constituents migrating from the landfill mass must first discharge to the surficial sand aquifer and then intersect Sequoit Creek. The two most likely primary off-site receptors, the surficial sand aquifer and Sequoit Creek, fail to exhibit impacts from vinyl chloride and as such, do not pose unacceptable risks. The RI data indicate that these two most sensitive receptors have not been significantly impacted. Consequently, it is reasonable to assume that the downgradient impacts from vinyl chloride in the deep sand and gravel aquifer do not represent an ongoing release from the Site.

e. Monitoring Well W3D, which is also downgradient of the landfill, but sidegradient of the industrial park and only 600 feet from US3D, did not exhibit concentrations of vinyl chloride above MCLs. Therefore, the extent of vinyl chloride in the deep sand and gravel aquifer is limited.

f. The BLRA assumes that the H.O.D. Landfill is the source of the concentrations present in US3D. This assumption may not be true. If these concentrations are due to the other documented possible sources of contamination (the industrial park or the fill areas located west of the H.O.D. Site), then the calculated risks may not have anything to do with the H.O.D. Landfill.

USEPA Response:

a. For the BLRA, USEPA quantified risk based on accepted USEPA policy. This policy states: "In the Superfund program, the exposure assessment involves developing reasonable maximum estimates of exposure for both current land use conditions and potential, future land use conditions at each site" (55 Federal Register 8710 (March 8, 1990)). The USEPA agrees that using RME protocol results in conservative estimates of risk.

b. The BLRA does not consider the number of residents that may be exposed to a drinking water pathway, but whether such a pathway exists. The BLRA does not consider the effectiveness of the public water supplier to provide safe drinking water. Also, although most of the area residents are connected to the Antioch public water supply, there are still area residents using private wells. USEPA guidance states that if a groundwater MCL is exceeded (as in this case), remedial action generally is warranted. The NCP requires remedial action to attain MCLs in groundwaters or surface waters that are current or potential sources of drinking water (40 CFR §300.430).

c. The BLRA is developed from the results of the RI; therefore, by definition, USEPA does not revise and reissue the BLRA based on more recent, analytical results. The RI occurred in the early 1990s. The USEPA agrees that vinyl chloride contaminant levels for well US3D are now lower than during the RI.

d. The issue of whether the vinyl chloride contamination is Site-related or whether the vinyl chloride contamination represents an ongoing release from the Site has not been conclusively resolved. Since the contaminant location is nearby and downgradient of the Site, USEPA believes the contamination is likely Site-related.

e. The extent of the vinyl chloride contamination in the deep sand and gravel aquifer is not entirely known at this point; therefore, USEPA included as part of the selected remedy a pre-design investigation to further study the extent, if any, of a groundwater, contaminant plume.

f. Please see response "d" above. Although industrial operations and land disposal of waste are possible sources of contamination, there is no evidence showing any specific source of vinyl chloride located in the industrial park or fill areas.

40. The Deep Groundwater Technical Memorandum presents the logic for not implementing an active deep groundwater remedy associated with the Site. It is critical that this document be entered in the Administrative Record, to be used as a resource during the pre-design investigation of the deep groundwater and establishment of the groundwater monitoring network. As described therein, and for the following reasons, active groundwater remediation is not necessary at the H.O.D. Landfill Site:

The source of vinyl chloride in the deep sand and gravel aquifer is uncertain and is unlikely to be identified. Potential nearby sources include the H.O.D. Landfill, the adjoining industrial park, or former waste dump areas to the west of the Site.

The limited distribution and existing concentrations of vinyl chloride in the deep sand and gravel aquifer do not represent a current or future risk to VW3, the nearest point of human exposure.

A suitable long-term monitoring program, particularly at US3D, should give adequate warning of a potential change in conditions that could impact VW3.

Implementation of source control measures that include capping and leachate and landfill gas control will reduce the amount of contaminants that may potentially enter groundwater from the H.O.D. landfill.

USEPA Response:

The USEPA has included the Deep Groundwater Technical Memorandum in the Administrative Record, as a comment on remedial options previously submitted by WMII.

The USEPA agrees that, based on current information, active groundwater remediation is not necessary. This ROD includes the following wording under Section IX (The Selected Remedy): "Should significantly more groundwater contamination be found during the pre-design investigation, should the VOCs in the groundwater be found to be migrating, or should the remedial actions taken not cause a decrease over time in the groundwater contaminant levels, then an active, groundwater remediation alternative will be considered as part of the remedial action for the Site."

41. The proposed pre-design studies for the deep sand and gravel aquifer, as described in the FS and discussed with USEPA, should be limited due to the factors identified in the RI/FS. Due to the other potential sources in the area, the installation of additional wells should be limited, with locations near (within approximately 300 feet of) US3D, downgradient of the Site. It is doubtful that the additional wells will determine the source of the contamination, and therefore, the pre-design studies will be of limited usefulness. However, the limited pre-design studies will help confirm the effectiveness of natural attenuation processes within the deep sand and gravel aquifer.

USEPA Response: The pre-design investigation will be limited, as described in Section VII (Description of Alternatives, alternative GW2) of this ROD.

42. The 7% discount rate used in the FS does not reflect current economic conditions. This discount rate is based on a June 25, 1993 USEPA OSWER Directive (No. 9355.3-20). However, this OSWER directive is over five years old and does not reflect currently

available rates. The solid waste industry has been using a discount rate of 3% as an appropriate rate to forecast future costs and, in fact, a lower discount factor (4%) has recently been used by USEPA at other Superfund Sites. Therefore, we believe a more realistic indication of the potential project remedial costs are reflected in the 3% cost tables included in Appendix D of the Final FS. It is important to note that the true cost of the proposed remedial action will be, in fact, higher given the lower prevailing discount rate.

USEPA Response: The USEPA OSWER Directive mentioned is still the current guidance for the discount rate to be used for Superfund cost estimates. For comparison purposes, the seven percent discount rate should be used for all Superfund cost estimates.

43. USEPA should clarify that the leachate from the Site can be managed at any POTW, where the quantity and quality of the leachate meets the criteria identified in local codes/ordinances. While the leachate from the Site is currently managed through the Fox River Water Reclamation District (FRWRD) POTW, there is no reason why the leachate could not be discharged to the Village of Antioch POTW, or another POTW, if it meets that POTW's current criteria.

USEPA Response: USEPA has made the requested clarification in this ROD that a POTW other than FRWRD may be used. It should be noted that in comment number 51 from the Village of Antioch in this Responsiveness Summary, the Village questions the capability of its POTW to accept the increased leachate volume for treatment.

Comments from the Village of Antioch

44. First of all, the Village wishes to emphasize the importance of the interconnection of all the USEPA (selected remedy components) and their full implementation. The selection of the lesser 807 cap, rather the 811 cap which would presently be required for a landfill, is acceptable only in conjunction with the proposed active nature of the withdrawal of leachate and landfill gas. With regard to the selection of an "807" rather than an "811" cap for the Site, the ARAR which specifies an 807 cap as suitable for this Site basically allows older landfills a lesser degree of protection than landfills presently being sited in Illinois. Such an ARAR is merely meant to designate a minimum and not prohibit a better remedy. However, if all the measures selected are fully implemented, the Village accepts the premise that the lesser cap becomes acceptable because the risk is reduced as active extraction reduces the mass of contaminants.

USEPA Response: The waste cap improvements of the selected remedy of this ROD are considered in conjunction with the gas collection and leachate collection active, dual extraction system.

45. The portions of the RI/FS which indicate the possibility that pre-design studies may later indicate that the active remedies selected are not necessary or that lesser measures may in

some way be considered are very disturbing. The Village residents need to assured that measures are being taken to control the landfill, not that controls might be abandoned and the goals shifted from one of active prevention of possible contamination of the aquifer to a reactive response if contamination occurs. It is impossible to make a meaningful comment to vague comments about pre-design studies without knowing the precise nature of those studies. The Village suggests that if any changes are proposed in the recommended measures as a result of "pre-design studies" that reduce in any manner the level of remediation, protection, or prevention, a renewed period for public comment must somehow be given in fairness to the Village residents who drink the water from the aquifer which underlies the landfill.

USEPA Response: The pre-design/pilot studies referenced in this ROD are for the active, dual extraction system component of the selected remedy. The USEPA will thoroughly review any such studies before considering a less than fully active, dual extraction system. Since the studies and the possibility of going to a less than fully active, dual extraction system are allowed for in this ROD, implementation of a less than fully active system would not constitute a fundamental change to the selected remedy, and would not usually warrant a renewed, public comment period. A fundamental change to the selected remedy of the ROD would necessitate a ROD Amendment, along with another public comment period and public meeting.

46. Part of our problem today stems from the failure of the landfill operator to install and fully use the landfill perimeter leachate collection system initially proposed and required as part of its IEPA permit requirements in 1974. A copy of that abandoned early total perimeter system with piezometers located every 500 feet is attached as Reference One. While the IEPA refused an operator request to abandon the system in 1976, IEPA Site inspections in 1978 showed it had been abandoned anyway; the IEPA then acquiesced to the abandonment and modified the permit rather than pursuing the notice of violation. In fairness to all, it should perhaps be stated that the operator claimed difficulties in construction of the perimeter system and creation of odors as among the reasons for abandonment. For whatever reason, we have a Site which lacks even a perimeter leachate collection system.

USEPA Response: The USEPA is well aware of the inadequacies of the current leachate collection system. The leachate collection component of the selected remedy is a substantial upgrade to the current system.

47. Page 1-5 of the FS notes the clay-rich diamict beneath the entire Site. It should be noted that an extensive sand lens or lenses were encountered in the construction of this landfill requiring the reshaping of the "new" landfill and the construction of man-made partial side and bottom seals along a portion of the southern border of the "new" Site, according to IEPA records of inspections and permits. IEPA approval of the Site as a suitable location, noted at page 1-6, took place in 1975, almost 25 years ago when the regulation and monitoring of landfills was just beginning in Illinois. Borings taken on and off-site

indicate some sand is present in the clay. Therefore, any use of the adjacent property as a soil-borrow pit should be carefully scrutinized.

USEPA Response: The USEPA will take this information into consideration before approving any potential borrow-pit materials.

48. It should also be noted that at Page 1-7 of the Feasibility Study, it is stated that a small portion of the landfill Site is currently owned by the Village of Antioch. Actually, the Village took title to about half of the Site by donation from WMII in 1974 subject to a 20-year reservation for use as a landfill. That ownership should support the Village's and its consultant's request that the Village be given copies of the quarterly cap monitoring data and other monitoring data as well, as it accrues. It is difficult to examine and adequately respond in 30 days to studies which have taken five years to prepare.

USEPA Response: The USEPA revised the wording in this ROD to note that the Village owns "a portion," not "a small portion" of the Site. Since it is not known at this time which entities will be performing the RD/RA, it is premature to discuss the distribution of remedial reports. Should one or more PRPs perform the RD/RA, the PRP(s) performing the RD/RA may work with other PRPs to develop a PRP distribution list for remedial reports. Should USEPA or one or more of its contractors perform the RD/RA, USEPA will discuss the distribution of remedial reports with interested PRPs.

49. The Village wishes to note what it believes is an error in Table 4-1 showing vinyl chloride found the Village Well No. 4 (VW4), which is the Village well closest to the landfill and no longer part of the public drinking water supply system. The Village has no record of vinyl chloride having been found in VW4 at the level of 6.7 ppb in 1984. We do show, however, that vinyl chloride was discovered at that 6.7 level in the sampling taken January 13,1989, when all the Village wells were tested for certain organics pursuant to a new state law. This is the discovery that triggered the Emergency Response from the USEPA in 1989.

USEPA Response: The USEPA notes this additional information; however, the information does not affect the selected remedy.

50. At Page 1-3 of the Feasibility Study it is noted that based upon 1993 records, approximately 450,000 gallons of leachate are removed from the Site yearly. According to WMII reports submitted to the IEPA, in the first three quarters of 1997, only 38,000 gallons of leachate were moved. In the fourth quarter an additional 25,000 gallons was removed for a total collection and removal of only 63,000 gallons from the Site for the year 1997. Reference Two. Evidently, the larger gallonage removal figures cited in the RI/FS of 35,000 gallons per month are based on what was done in 1993.

USEPA Response: The USEPA notes this additional information; however, the information does not affect the selected remedy. If the WMII estimates in the Feasibility Study (FS) for current leachate removal rates are overstated, it becomes more important to include the active, dual collection system in the selected remedy as USEPA has done.

51. It appears that leachate has been allowed to accumulate, and a great deal of treatment capacity will have to be located. Candor requires us at this point to state that the Village POTW would not be able to participate as an alternative POTW in this remedy due to our small size, construction, location, history of problems and restrictions, and lack of adequate monitoring for a leachate waste stream whose characteristics we believe may vary from the leachate profile presently postulated once active extraction becomes a reality. (Our capacity is 1.6 MGD while the Fox River Water Reclamation District's average day flow is 12 MGD.) No mention of such possible use of our POTW was made in the August 11, 1998, public presentation by the USEPA, perhaps because of awareness of our POTW size and prior problems, but the operator has raised the issue with us. (The possible use of other POTWs is mentioned at Page 3-19 of the FS and at page 4 of the June 3, 1998, WMII Responses to the May 20,1998, USEPA Comments.)

<u>USEPA Response:</u> If a POTW other than the Fox River Water Reclamation District is used for leachate treatment, the alternate POTW must be a viable candidate for accepting the leachate, and the leachate transporter must satisfy the permitting requirements of the alternate POTW.

52. With regard to Page 3-3 of the FS, Section 3.2.1 No Further Action Alternative, the Village comments that no real coherent leachate collection system is in place and that the total amount of leachate removed for the year in 1997 according to reports to the IEPA was 63, 000 gallons for the entire year, not 6,000 to 8,000 gallons per week. Since the leachate is not really being extracted, it raises the consideration of where the infiltration which the present state of the landfill cap presently allows into the Site is going.

<u>USEPA Response:</u> The USEPA is aware of the inadequacies of the current leachate collection system. The inadequacy of the current waste cover is allowing substantial infiltration, such that much leachate is being generated. Some of this leachate is migrating to the groundwater. The USEPA will expeditiously pursue implementation of the selected remedy to minimize leachate generation and migration.

The USEPA will note in this ROD the 63,000 gallons removed in 1997. WMII of Illinois claims that this was an abnormally low yearly rate, and that the 1998 rate is closer to 1,000 gallons per week.

53. At Appendix D, Page 17 of the FS, the statement is made that "Historically leachate elevations have remained fairly constant; therefore assume the average leachate elevation as of 4/94 is still representative." The Village comments that historically there has never been a consistent, continual leachate extraction from the Site sufficient to counteract the effect of infiltration, yet alone the millions of gallons of liquid specials wastes that were

deposited. One is left to ponder where that logically increasing volume of leachate is, if not still on the Site. In actuality, the December 19,1997, leachate level readings from the fourteen on-site piezometers used in the Appendix calculations indicate an average leachate elevation of 768.95 feet ((766.96 + 767.90 + 765.37 + 771.92 + 770.21 + 783.13 + 780.47 + 760.94 + 764.96 + 765.90 + 771.49 + 764.81 +766.22 + 764.97) divided by 14 sampling points). The level in monitoring well G11D was 760.18 feet, indicating a permit level for leachate of 758.18 feet. These levels show an increase in the average leachate level of 1.89 feet over 51 acres, a substantial increase for the active leachate extraction system to remove. As part of the pre-design studies for the RD, one might consider subtracting the amount of actual leachate amounts withdrawn from 1994 through 1998, calculating the assumed infiltration, and reviewing the actual leachate levels to examine the validity of assumptions regarding the present landfill cap or conversely the possibility of off-site migration of the leachate.

USEPA Response: The USEPA notes the additional information on leachate volumes; however, this information does not affect the selected remedy. The USEPA is aware of the inadequacy of the current waste cover (allowing excessive infiltration and leachate generation) and of the inadequacies of the current leachate collection system (allowing excessive leachate mass in the landfill). The selected remedy includes a substantial upgrade to the current leachate collection system. If the expected leachate removal requirements have been underestimated in the FS, it becomes more important to implement the active leachate collection system described in the selected remedy. During RD review, USEPA will review the capabilities of the active leachate collection system to remove sufficient volumes of leachate and to minimize leachate migration.

54. This is a landfill that accepted millions of gallons of liquid industrial wastes under the State of Illinois special wastes system in the late seventies-early eighties. This system allowed liquid wastes with certain minimal concentrations of contaminants today considered hazardous to be placed in solid waste landfills and mixed with "regular" garbage. These special waste streams were generally not even tested for the presence of some of the present contaminants of concern at this Site, like vinyl chloride and 1, 2 dichloroethylene. Today, of course, such liquids, any liquids, are not permitted into solid waste landfills. Even then for good Site management, it was believed that one needed to maintain a certain daily solid-to-liquid ratio, something which did not always happen at our Site, based upon an analysis of the IEPA manifests of the special waste streams permitted and accepted by the Site during the late 1970s and early 1980s. Thus, the Village believes that the leachate on-site may be far less uniform that assumed for typical municipal landfills and computer-modeling programs thereof which recognize and account for the addition of small amounts of hazardous household wastes.

USEPA Response: The USEPA thoroughly studied leachate characteristics during the RI. The USEPA believes that the leachate collection component of the selected remedy will sufficiently reduce the leachate mass in the landfill and significantly reduce leachate migration to the groundwater.

55. With regard to Page 1-20 and the BLRA statement that VW4 has been taken offline, it is important to note that the nearby major Village Wells Three and Five are screened in the same aquifer. Present water distribution problems with regard to the new Village Well Seven are causing increased use of these wells. We have not as yet been able to fully use the new well to replace Well No. 4 and as a result, both of the remaining wells in this aquifer are working overtime and being heavily used. These wells are major workhorses for the Village and we cannot overemphasize the importance of protection of that aquifer for Village residents.

USEPA Response: The USEPA is aware of the proximity of Village Wells Three and Five to the area of contaminated groundwater. The main purpose of the selected remedy to protect human health and the environment is for the protection of groundwater for human consumption.

56. The RI/FS indicates that the leachate levels are substantially above those allowed in the IEPA permit. Such conditions also prevailed in 1989 prior to the finding of vinyl chloride in Well. No. 4. In the course of litigation with the Village regarding the landfill, WMII pointed out that Well No. 4 had been used more heavily than normal in the months that preceded the 1989 sampling done pursuant to a new State law. As previously stated, we are presently having to use both Wells Three and Five more than normal due to the integration and distribution problems of the new well No. Seven. Therefore, it would seem wise to increase the withdrawal of leachate from the available point withdrawals to reduce the buildup of leachate and any pressure toward off-site or downward movement of the contaminants during any pre-design phase or other delays. The present RI/FS reported rate of withdrawal of 35,000 gallons per month has not kept up with the present presumed infiltration and the IEPA permit requirement for the Site regarding the leachate levels which are two feet below the level in G11D. Further, as reported to IEPA, the volume of leachate actually extracted and removed from the Site for 1997 was 63,000 gallons for the year, not per month. Reference Number Two. Given the reliance on Village Wells Three and Five, the Village comments that leachate withdrawal should be on-going during the pre-design studies at a much greater rate.

USEPA Response: Due to the unacceptable infiltration rate and leachate volume being generated, USEPA will expeditiously pursue implementation of the selected remedy, which includes an upgraded leachate collection system.

The USEPA will note in this ROD the 63,000 gallons removed in 1997. WMII claims that this was an abnormally low yearly rate, and that the 1998 rate is closer to 1,000 gallons per week.

57. The Village questions the inclusion of the capital costs of Well No. 7 and the costs the Village will incur upon capping Well No.4. They are not part of the RD to be undertaken and their inclusion appears to make those alternative remedies which essentially recommend doing nothing as having done something positive to ameliorate the threat to the public drinking water.

USEPA Response: The inclusion of groundwater monitoring alternative capitals costs of installing Village Well Seven and capping Village Well Four was for reference purposes, and was not intended to overemphasize the groundwater monitoring component of the No Further Action alternative or of the selected remedy.

58. Some of the previous Site investigations noted at Page 1-8 were undertaken by WMII during the course of litigation with the Village regarding the Site. Much earlier in this Site investigatory process, the Village had offered to provide to USEPA data and analysis done by independent consultants and certified laboratories obtained in the course of litigation. We were informed that USEPA would generate its own data and analysis outside the framework of litigation, an understandable point of view. We are, therefore, somewhat disconcerted to find that the RI/FS contains citation to and reliance on data and reports generated by WMII in the course of that same litigation. In view of our consultant's review and concurrence with the selected remediation remedies, there appears to be little cause for concern over this problem. However, for the record, our available data and scientific analysis did not support statements or inferences made in the RI/FS such as positing the existence of a continuous clay diamict with no pathway for transmission or the finding of no organics of concern in the deep sand and gravel beneath the Site. Often, even with split samples, our results would differ. Based on the limited data and sampling sites available, the Village disagrees with sweeping statements which are then used to support an argument that landfill is not responsible for adjacent contamination. The Village states in response to the assertion at Page 1-12 of the FS that the conclusion that "the downward migration of VOC's from the surficial sand through the clay diamict does not appear to be occurring" was not supported by the independent consultants of the Village and data generated by them in the course of Site litigation. Again, in view of the USEPA decision to clean up the Site and the specific recommendations of remedies, the continual caveat in the FS that the vinyl chloride may not be coming from the landfill (Page 2-3 of the FS) may not be important, but the Village wishes to emphasize just as continually that its independent data and the interpretation of Site data by qualified groundwater scientists and landfill experts did not support this conclusion.

USEPA Response: The USEPA acknowledges differences in opinion between the Village and WMII on the characteristics and dynamics of the Site. Since WMII was the only PRP to agree to conduct the RI, USEPA reviewed related WMII documentation. WMII's position that the vinyl chloride contamination is probably not Site-related was considered and rejected in USEPA's decision to move forward with the selected remedy.

59. In somewhat the same vein, the Village comments that the use of one or two additional sampling wells as part of the pre-design investigation study to define the very existence of a contaminant plume in an area where the groundwater flow direction has been affected by the zone of influence of a nearby pumping Village well seems chancy. The odds of hitting such a plume with only two wells is not particularly large.

USEPA Response: The USEPA will thoroughly evaluate the Pre-design Investigation Work Plan, especially with respect to the number and location of wells to be installed.

60. Enclosed herewith and adopted by the Village as part of its Comments is the report of Dr. Alphonse Zanoni to the Village. (Reference Three). We have attached Dr. Zanoni's Curriculum Vitae as Reference Four. His outstanding credentials and long involvement with the Site give great merit to the few additional suggestions he makes. He has been extremely instrumental in reassuring the Village that the USEPA selected remedies, if fully and actively implemented, will substantially ameliorate the situation. As indicated before, his and the Village's acceptance and approval of the cleanup program, including a reduced cap and the selected GW2 monitoring plan, is based on the ongoing active removal of leachate and landfill gas from the Site. Without such an active extraction program to reduce the mass of contaminants within the landfill, the groundwater monitoring plan and the cap selected are not adequate.

USEPA Response: The USEPA has responded separately to Dr. Zanoni's comments below. The USEPA acknowledges Dr. Zanoni's concurrence with the preferred alternative of the Proposed Plan. The active leachate and gas collection system is part of the selected remedy.

Comments from Dr. Alphonse Zanoni (submitted as part of the Village of Antioch comments)

61. For the capping component of the preferred alternative, it is important that the landfill cap be properly maintained in future years. While new refuse has not been added to the Site for 15 years, the previously deposited refuse is still undergoing decomposition, and producing leachate and gas. Differential settlement will continue to occur at the Site in future years, but at a lesser rate in comparison to past years. A properly maintained landfill cap will minimize the amount of precipitation that enters the refuse mass through infiltration. As noted in the FS, it is expected that approximately 1.6 inches per year of precipitation will infiltrate the landfill soil cap and enter the refuse mass. Under steady state conditions, even this controlled level of infiltration has the potential to produce approximately 6,000 gallons per day of leachate. It is of interest to the Village to ensure that the landfill cap be maintained in the best possible condition in future years. As noted in the FS, quarterly inspections to assess Site conditions will be conducted in the future. I recommend that the inspection reports be submitted to the Village of Antioch to ensure that future maintenance of the landfill cap occurs when needed.

USEPA Response: The USEPA selected remedy calls for proper installation of cap improvements, proper maintenance and inspection, and proper reporting to ensure that the remedy is effectively working. Since it is not known at this time which entities will be performing the RD/RA, it is premature to discuss the distribution of remedial reports. Should one or more PRPs perform the RD/RA, the PRP(s) performing the RD/RA may work with other

PRPs to develop a PRP distribution list for remedial reports. Should USEPA or one or more of its contractors perform the RD/RA, USEPA will discuss the distribution of remedial reports with interested PRPs.

62. For the gas collection/treatment and leachate collection components of the preferred alternative, I believe the Village is best served by the installation of an active system for the management of gas and leachate that will continue to be generated at the Site. I concur with the FS that the G3 and LC4 alternatives should be considered together "because the required construction for each of these alternatives is similar." As was noted previously, given the estimated 1.6 inches per year of infiltration through the landfill cap, leachate will be continuously generated at the Site. While the concentration of leachate constituents will continue to decrease with time, it will take many years before the leachate constituents ameliorate to the level that they will no longer pose a potential hazard to the groundwater aquifer which serves the Village's public water supply source. An active leachate extraction system as presented in Figure 12 of the FS should provide the Village a level of protection of its water supply source that is not available at the present time, and approaching the level of protection that would certainly be there if a municipal landfill were being designed and sited today. Since the decomposition process will continue for many years into the future, though at a continuously reduced rate, landfill gas also needs to be actively managed for many years. Again, as noted in the case of the leachate extraction system, an active gas management system would be an integral part of a modern municipal landfill design today.

Of some concern to me is that in the FS, reference is made to the proposed pilot/pre-design studies, and that the results of these studies "may indicate that the fully active system proposed under G3 is not necessary, and that G2 is sufficient to address the landfill gas (LFG) at the Site." I believe that it is in the best interest of the Village that an active LFG and leachate extraction system be constructed and operated at the Site. While pilot/pre-design studies are certainly beneficial, the scope of this effort cannot equal what could be accomplished at the Site with a full, in-place gas/leachate management system of the type depicted in Figure 12 of the FS. I want to stress that my overall concurrence of the USEPA-recommended plan noted at the beginning of this statement is predicated on the assumption that an active LFG and leachate collection system is constructed at the Site. An in-place system of this type, even if not fully used, will provide the Village's public water supply source with an added level of protection.

Finally, I concur with the statements in the recommended remedial actions for active LFG and leachate management that following construction of the necessary facilities, that they be properly operated and regularly maintained. The Village should receive the monthly inspection and monitoring reports to ensure that these requirements are properly satisfied.

USEPA Response:

The USEPA selected remedy calls for proper implementation and operation and maintenance (O&M) of the active, dual gas and leachate extraction system. Before USEPA considers a lesser system as a result of pilot/pre-design studies, USEPA must be assured that the lesser system will be protective of human health and the environment. If USEPA is not convinced of this, it will not approve a lesser system.

Since it is not known at this time which entities will be performing the RD/RA, it is premature to discuss the distribution of remedial reports. Should one or more PRPs perform the RD/RA, the PRP(s) performing the RD/RA may work with other PRPs to develop a PRP distribution list for remedial reports. Should USEPA or one or more of its contractors perform the RD/RA, USEPA will discuss the distribution of remedial reports with interested PRPs.

63. Leachate treatment at a licensed POTW is a common method of disposing leachate generated at a municipal landfill site. Understandably, the leachate characteristics must meet the industrial discharge requirements that are in force at the POTW in question. As noted in the FS, approximately 35,000 gallons per month are currently extracted from the Site. The Village should be aware that following construction of the active leachate extraction system, the quantity and characteristics of leachate generated at the Site will probably change. It is not possible at this point to estimate the extent to which the leachate quantity will approach the steady state value of approximately 180,000 gallons per month that would result with complete capture of the estimated infiltration value of 1.6 inches per year referred to previously in this statement. Obviously, the POTW which will receive the leachate in the future should be prepared to handle the potential changes in leachate quantity and quality noted above.

USEPA Response: For the leachate treatment component of the selected remedy, USEPA allows for an alternate POTW to be used if the current POTW (the Fox River Water Reclamation District) cannot properly treat the leachate.

64. For the monitored, natural attenuation component of the preferred alternative, one of the first concerns I expressed publicly is the close proximity of the Site to the Village's public water supply source. Virtually all current landfill siting criteria would not allow the construction of a municipal sanitary landfill at this location. For this reason, I view this remedial action to be of great import to the Village of Antioch, since it directly relates to the future quality of the community's public water supply source. It is known that natural attenuation can reduce the impact of leachate which migrates downgradient from the landfill. The greater the distance between the origin of the leachate and the water supply source, the greater is the level of protection afforded by the mechanism of natural attenuation. In the case of the Village of Antioch, active community water supply wells VW3 and VW5 are a relatively short, downgradient distance from the southwest corner of the Site. Hence, the proposed groundwater monitoring plan

presented in Figure 15 of the FS, showing sampling wells downgradient of the southwest corner of the Site, is highly beneficial to the Village of Antioch. I concur with the sampling plan described in the FS (pages 3-21 to 3-23) and recommend that the Village aggressively monitor this remedial action in future years to ensure that the Proposed Plan is followed in all respects. In addition, I recommend that the Village of Antioch ask that the following four analytes be monitored quarterly for the full 30-year period: nitrate, chloride, conductivity, and total organic carbon. These analytes will serve as possible "tracers" of leachate migration and degree of natural attenuation. The result of this additional monitoring data could serve to alert the community at some point in the future that other measures may have to be taken to maintain the quality of the Village's public water supply.

USEPA Response:

The USEPA is aware of the proximity of Village Wells Three and Five to the Site, and is also aware of the importance of implementing a meaningful groundwater monitoring plan to alert USEPA and others to possible drinking water safety concerns. The groundwater monitoring plan in the GW2 component of the selected remedy is a suitable plan that will be refined during the RD.

The USEPA will evaluate the list of monitored, natural attenuation parameters in the groundwater monitoring plan during the RD. Nitrate, conductivity, and total organic carbon are already included as monitored, natural attenuation parameters in the GW2 component of the selected remedy.

Comment from the United States Army Corps of Engineers (USACE)

65. The USACE does not anticipate that implementation of the Proposed Plan would impact any Chicago District planning projects, and does not feel that implementation of the Proposed Plan would have any significant or long-term adverse environmental effects.

    If wetlands exist at the project area, a permit application (Section 404) should be submitted to the Chicago District's regulatory functions (CO-R) branch.

USEPA Response: The USEPA appreciates the comment from USACE. Implementation of the selected remedy is not expected to impact the wetlands adjacent to the Site; therefore, a permit application should not be required.

APPENDIX B: ADMINISTRATIVE RECORD INDEX

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
H.O.D. LANDFILL SUPERFUND SITE
ANTIOCH, LAKE COUNTY, ILLINOIS

ORIGINAL
JUNE 30, 1992

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	00/00/00	Ruddy, W. & D. Yeskis; U.S. EPA	Yeates, T., FIT	Request for FIT Services	1
2	08/24/82	Molenhouse, R., Waste Management	Amendola, H., Pollution Control Commission	Permission to Release Leachate Analysis	1
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